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Factors Influencing the Adoption of Institutional Repository Systems by Academic and
Research Library Leadership

by

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A dissertation submitted in partial fulfillment of the requirements for the degree of
Doctor of Education.

Hamline University

Saint Paul, Minnesota

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ABSTRACT

Academic and research libraries are dependent on a wide range of technology and systems to manage access and storage of digital research materials and collections. Given the high level of costs and staff needed to support these systems, the factors that influence library leadership in their decision making process to support or adopt new technologies is important. In order to understand the various dynamics involved with this decision making process, this study specifically examined influencing factors that academic library leaders use in their decisions to support or adopt institutional repository (IR) systems. This mixed method research study used both a quantitative research survey instrument that was adapted from the Technology Acceptance Model (TAM), that was then followed by semi-structured interviews to address the research questions presented in this study. The overarching research question of this study was, do the factors of usefulness, ease of use, need, cost effectiveness, and reliability influence academic library leaders' decision making process regarding the adoption and ongoing support of technology initiatives, in this case IR systems? The data collected from this research reveal that library leaders place a significant emphasis on the factors of the perceived need, reliability, and perceived usefulness of an IR system. Building on these factors, interviews with senior library leaders revealed that the influencing factor of costs or ability to fund a system was a constant presence in their decision making rubric.

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CHAPTER ONE

Introduction

Overview of the Research Problem

One of the most important activities that leaders and managers conduct is that of making decisions within their organizations. Depending on their responsibilities within the organization, these leaders may make decisions from managing staff activities on a daily basis to making long reaching strategic planning decisions for a whole organization. Within higher education leadership, decision making is found at both a campus-wide level, as well as at the school or department level. The library is one department or unit on campus that makes decisions that not only affect the unit itself, but also the campus community as a whole. The focus of this study is on the influencing factors of why academic library decision-makers adopted institutional repository (IR) systems, which will be studied using a mixed methods research approach for data gathering, that includes using the quantitative technology acceptance model (TAM) by Davis (1989), for the survey gathering instrument, and then being followed up with semi-structured interviews to further explore these survey results. The goal of my research is to increase existing knowledge and contribute to the understanding of the factors influencing the adoption of IR systems within higher education libraries.

Higher education is increasingly reliant on a variety of technology systems that are critical for the mission of the institutions. These systems may include learning management systems, student information systems, personnel and payroll systems, and

academic library systems (Lang & Pirani, 2014). These mission-critical systems are also expensive to implement, operate, and maintain. As technologies advance and change, switching existing legacy systems to newer current systems can be highly time consuming for staff and expensive (Barreau, 2001).

These costs do not only exist in the technology infrastructure, but also in training and retraining of staff, faculty, and students who use these systems on a daily basis. For these reasons, understanding how leaders make these important and costly technology adoption decisions is important in being able to not only understand the decision-making process but also to possibly enable better processes and guidance for these decisions to be made.

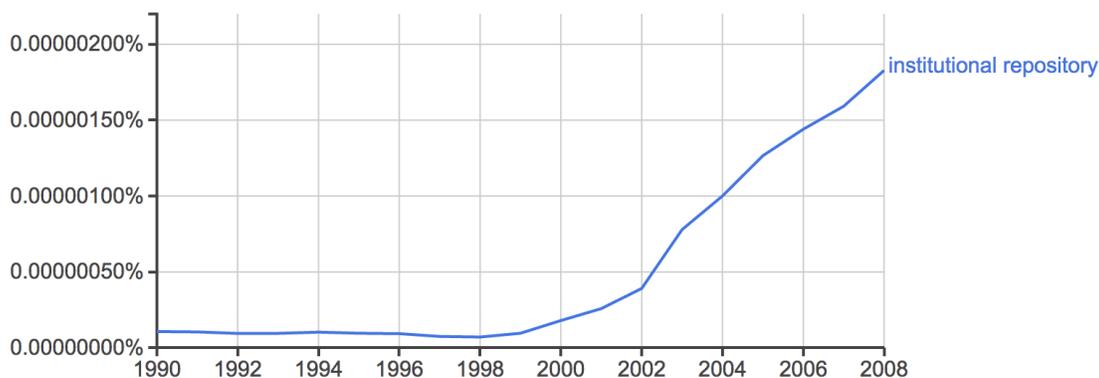
As a librarian and administrator that has worked in higher education for the past 20 years, I have witnessed and been active in numerous technology adoption and implementation processes. A steady rate of adoption of new technologies to meet the changing role of the academic libraries function and role on campus has been witnessed since I started working in academic libraries in the mid-1990s. Many of these technologies' adoptions have been evolutionary and were initially developed as a means that mimicked the print-based information resources and services that libraries provided in the pre-internet era (Digby, 2004). Within the past twenty years, there have been additional technologies that academic libraries have developed and adopted to meet the needs of the evolving role of the library within college and university settings. Institutional Repositories (IR) are one of the technologies that libraries have implemented that are a response to the evolving roles. Although there are different types of repository

systems implemented at libraries this dissertation will focus on the institutional repository as a specific type of repository. An IR, as defined in this study is a digital library service which “capture(s) the original research and other intellectual property generated by an institution's constituent population active in many fields” (Crow, 2002, p. 3). IR’s can provide faculty and students with a system where they can store and share both research and teaching materials. These may include non-published research, data sets, and presentation materials. IR also can provide a place to store the documentation of the record of events at any given academic institution (Hall, 2014), which plays an important role in a world of materials being born digitally and not having a physical copy that can be placed in the campus archives.

As seen in the graph (see Figure 1.1), an examination of the historical frequency of usage of the term “institutional repository” within the corpus of the books digitally contained within the Google Books repository, using the Google Books Ngram Viewer, displays a sharp increase since 1998.

Figure 1.1

Historical of the term “institutional repository”



Note. Historical frequency of usage of the term “institutional repository” from 1990 to 2008 (Google Books Ngram Viewer, 2017)

The growth of IRs within academic libraries has been significant over the past two decades, as has the use of the term in the literature indexed by the Google Books Ngram Viewer. Although there was an increase in the occurrences of the institutional repository term being used in literature, until 2005, there was “relatively little systematic examination of the actual state of deployment of institutional repositories in higher education (or even among research universities) across the United States” (Lynch & Lippincott, 2005, para. 2).

This growth of a new library information technology system has taken place within the entirety of the time that I have been a professional academic librarian and academic technology administrator, so I have witnessed many of the decisions involved in this growth. Given that new technology adoptions within organizations include not only the implementation costs, but also personnel and yearly support costs, these

decisions are complex and involve high-level leadership decisions within organizations and in this case, the academic library setting.

The technology adoption decisions made by individuals and leaders are dependent on a variety of factors. There have been numerous research studies that have identified major factors that are important components in the decision to adopt new technologies. These factors include the perceived usefulness, ease of use, cost-effectiveness, and reliability of the technology that is being examined for adoption (Cox, 2013; Lease, 2005; Roberts & Pick, 2004). The decision to adopt new technology is only part of the process for successful technology adoption. For these adoptions to be successful, research indicates that organizational leadership at senior levels, must be supportive and committed to the project (Cox, 2013). This study will only focus on the influencing factors involved with technology adoption and not necessarily about how successful these technology adoptions are, once adopted.

The objective of this research is to add to the knowledge of how certain factors influence academic library leadership into decision making about the adoption of new library systems and services, with a specific focus in this study with the adoption of institutional repositories within their organizations.

Research Questions

Institutional administrators and leaders in academic libraries require a basis of information and prior practice on which to make their technology adoption decisions. Understanding what factors are more critical in this decision-making process, through prioritization, may aid in how librarians and technologists formulate the information

gathering and pre-adoption phase of a technology initiative in ways that are more receptive to senior library leadership. Many studies have been conducted that seek to understand how academic library leadership make decisions (Connaway, Hood, Lanclos, White, & Le Cornu, 2013; Hiller & Self, 2004; Mash, 2008; Memmott, 1985; Roosa, 2015). These studies, however, have generally focused on traditional decision making surrounding library collections, staffing, services, and building initiatives. After a thorough search of the academic literature, there have been limited studies examining technology adoption decision making factors within libraries.

One of the goals of this research is to analyze the decision making factors by utilizing the TAM (Davis, 1989) to examine how a number of technology acceptance factors affect a technology implementation decision. The TAM is a survey research instrument that is used to understand individual use and acceptance of technology and information systems, through accessing two key beliefs: perceived usefulness and perceived ease of use, and users' attitudes, intentions and actual computer adoption behavior (Davis, 1986).

By using the TAM survey as the basis for the first data gathering section of this study, a single dependent variable and five independent variables are used. This study will be based on using one dependent variable, the adoption of an Institutional Repository system by academic library leaders. Since all the survey participants were from institutions where the IR has been adopted, this dependent variable was the same for all survey respondents. There are five independent variables that were examined. Two of these independent variables relate to technology adoptions and are focused on the

perceived usefulness and perceived ease of use that were initially contributed by Davis (1989) to the TAM. Three additional independent variables relating to the influencing factors in the adoption and ongoing support of IRs by academic library leaders are being used in this study. These additional independent variables are need, cost-effectiveness, and reliability, which have been used as part of previous TAM research (Cox, 2013; Lease, 2005; Vankatesh & Davis, 2000).

The primary research question for this study is: Do the factors of usefulness, ease of use, need, cost effectiveness, and reliability influence academic library leaders' decision making process regarding the adoption and ongoing support of technology initiatives, in this case IR systems?

The overarching question, above, was further studied using the TAM survey to answer a number of sub questions related to the questions above,

Research sub-question 1: To what extent does perceived usefulness (PU) influence academic library senior leadership to adopt or continue to support an institutional repository system?

Research sub-question 2: To what extent does perceived ease of use (PEOU) influence academic library senior leadership to adopt or continue to support an institutional repository system?

Research sub-question 3: What influence does perceived need have on the adoption or ongoing support of an institutional repository system?

Research sub-question 4: What influence does cost-effectiveness have on the adoption or ongoing support of an institutional repository system?

Research sub-question 5: What influence does reliability have on the adoption or ongoing support of an institutional repository system?

Once the survey data was collected, the research question and subquestions were further studied through the use of a semi-structured interview process with academic library leaders. During this interview process, the additional sub-question of were there additional influencing factors for the adoption or ongoing support that were not covered in those identified in the TAM survey.

The interest through which I developed these research questions will now be explored with a focus on my personal rationale that motivates me in this area of research, including my rationale for the chosen research framework of this dissertation that provides a background on why the chosen research methodologies are being used for conducting this research study.

Personal Rationale

Throughout my professional career, within a variety of higher education institutions, I have made decisions at various levels. My roles and responsibilities evolved to making increasingly larger scale decisions. These have included technologies such as integrated library systems (Aleph, Alma, Voyager, PALS, NOTIS), learning management systems (Desire2Learn, Canvas, Moodle) and media management systems (Kaltura, Mediasite).

As I worked with others, including those that reported to me and those whom I reported to, I have become intrigued by how leaders differ in what inputs and factors they use to make decisions. I have witnessed decisions made based on examining evidence

and multiple viewpoints, internal/external influences/stakeholder needs, whereas other times decisions have been made with little evidence and more from a personal or what I perceived being a result of media or vendor created product or service hype. Currie (2003), when examining application outsourcing, concurred with my assessment, as she identified that “knowledge acquisition about application outsourcing was often informal and ad hoc, usually fuelled by vendor hype rather than a rigorous evaluation of vendor capabilities matched to user requirements” (p. 208). The user requirements, in this case, can broadly be defined to include cost, effectiveness, ease of use, reliability, specific application or service needs.

My experiences have shown that without solid decision-making, new initiatives are more prone to having issues fitting into the existing workflows and strategic plans of an organization. Technology implementations that do not align with an organization's strategic plans are not only harder to justify, but they are hard to sustain if the implementations take longer or become more expensive to operationally support.

Working with information and learning technologies within higher education, the decision making usually revolves around technology systems and services that support college and university activities and needs.

Rationale for the Conceptual Research Framework

This study aims to bring together a research framework using perspectives from a number of different disciplines, including education, libraries, management, leadership, and information technology. The intersection of these disciplines combines to bring about scholarship defined by Boyer (1990) as “Making connections across disciplines, placing

specialties in larger context, illuminating data in a revealing way, often educating non-specialist” (p. 18).

The research questions developed through my personal experience working with educational leaders and my role as an academic and library technology leader. After extensive research in this area, it is apparent that a high percentage of the research that has been done regarding technology decision making in education has been conducted using a qualitative design and interviews as the way to gather data. (Neuman, 2014) The limited interview samples and scope of these studies have resulted in researchers suggesting that further understanding of decision-making factors may necessitate survey research to broaden the understanding (Jamieson, 2007). Many of these studies have been based on case study research and have involved qualitative interviews for data gathering (Campbell, 2014; Campbell-Meier, 2008; Davis, 2008; Dodd, 2013; Galla, 2009; Lease, 2005; Yaure, 2004).

Although these studies focused directly on similar research questions to mine, they are narrowly focused and do not focus on academic library administration and leadership. This study defines academic library leaders as those at the Dean/Director level and those at the Assistant/Associate Dean or Director level. There have been studies that have used quantitative research instruments, such as the TAM, but these studies have been focused on non-library academic areas, most commonly in business technology management or business realm, (Cox 2013; Lease, 2005; Taylor, 2019; Wheelock, 2013; Wright, 2018).

Given past approaches that have been used in the past to examine research questions similar to mine, it is important to first examine the definitions of both quantitative and qualitative research methods. According to McMillan and Schumacher (2010), quantitative research “designs emphasize objectivity in measuring and describing phenomena” (p. 21). My research questions lend themselves to objectively measure and describe factors or characteristics that make up a leader's decision-making process. Qualitative research designs “emphasize gathering data on naturally occurring phenomena. Most of these data are in the form of words rather than numbers” (McMillan & Schumacher, 2010, p. 23). Both quantitative and qualitative approaches are approaches that lend themselves to my type of research question, however, in an effort to gather specific information about decision-making factors across a possibly large and diverse type of subjects, a quantitative approach has been chosen as the methodological framework for this study.

Terminology

This section will provide brief definitions of significant terms that will be used throughout this study. By defining these terms readers will have a better framework for how these terms are used in this study.

Academic Libraries - Academic library refers to a library that supports a post-secondary educational institution, usually found within the college or university.

Institutional Repository - a digital library service which “capture(s) the original research and other intellectual property generated by an institution's constituent population active in many fields” (Crow, 2002, p. 3).

Library leadership - pertains to those individuals in key decision making and leadership positions found in the library. For this dissertation, this will refer to those individuals that have positions as library directors or deans, as well as those librarians occupying library sub-department heads.

Perceived ease of use - “The degree to which a person believes that using a particular system would be free of effort” (Davis, 1989, p. 320).

Perceived usefulness - “The degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989, p. 320).

Technology acceptance model (TAM) - A survey research instrument used to determine user acceptance of information systems, with a goal to provide an explanation of what determines a user's acceptance and behavior across a broad range of end-user computing technologies (Davis, Bagozzi, & Warshaw, 1989).

Adoption - The acceptance, implementation, and use of a given technology system.

Need - The IT services and products as perceived by decision-making managers on procurement and adoption.

Cost-effectiveness - The costs-benefit of an investment to assess whether it is worth doing from an economic perspective.

Reliability - The dependability and availability of a given technology.

Summary of Chapter

This study builds upon my personal and professional interests in how higher educational leadership and decision making intersect with the implementation of information technology systems. The specific goal of this study is to improve upon

existing knowledge and contribute to the understanding of the factors influencing the adoption of IR systems within higher education academic libraries. This research was studied using the survey based on the technology acceptance model (TAM) by Davis (1989) and then followed up with semi-structured interviews with senior academic library leaders. This chapter has examined my research problem and questions, my research and conceptual research framework rationale, and an overview of the main terminology used in the study.

The following chapters within this study are organized into the following chapters. The second chapter will focus on a review of the literature. Chapter three will examine the research methodology of this study. The fourth chapter provides the results and analysis for both the survey and interview sections of this study. The final chapter (five) examines the results of the data collected, any methodological limitations and additional implications for future research that can be conducted based on the findings.

CHAPTER TWO

Literature Review

Introduction to the Literature Review

The objective of this research is to bring a better understanding of how academic library leadership and decision making about the adoption of new library systems and services, with a specific focus in this study with the adoption of Institutional Repositories within their organizations. To aid in gaining a better understanding of this objective, literature in the areas of leadership and decision making, the Technology Acceptance Model (TAM) as the primary research instrument used in this research, and finally the history current status of academic Institutional Repositories (IR) examined through the lens of the TAM model variables. Given that each of these areas has been researched and written about as independent areas and has a long history of scholarship, this review will summarize the research in these areas sufficient to understand how these areas are being utilized for this study. This literature review cannot be considered as an exhaustive or complete review of any one of the three areas being reviewed.

Leadership and Decision Making

At the heart of my research interest is the concept of leadership as an attribute of those individuals that make technology decisions in academic and research libraries. Although there are multiple ways that leadership can be defined, in this instance I am using the Northouse (2016) definition that “Leadership is a process whereby an individual influences a group of individuals to achieve a common goal” (p. 6).

In my two decades of working in public higher educational institutions, I have witnessed variety in the types or styles of leadership in those that have supervised me or in the senior leaders at the highest levels. With this experience, I feel that certain leaders exhibited a higher level of organizational commitment and had higher levels of overall satisfaction of the staff that reported to them. Although I was never able to validate the leadership styles of these individuals, they generally exhibited the ten characteristics that Northouse (2016) identified as part of the makeup of a Servant Leader. These ten characteristics include:

- Listening - Servant leaders listen first and through this the viewpoint of others is acknowledged and is seen to validate their perspectives.
- Empathy - By trying to see the world from the other person's view point, servant leaders try to understand what a person is thinking and feeling.
- Healing - Servant leaders exhibit caring for the well-being of those they lead and attempt to help them overcome problems.
- Awareness - Servant leaders try to be aware of their surroundings and the different social and political environments they find themselves within.
- Persuasion - By using clear and persistent communication a servant leaders use non judgemental arguments to present their case, which is opposite of using their positionality to force ideas or activities on those they lead.
- Conceptualization - With a clear sense of goals and directions, servant leaders focus on a bigger picture vision of an organization's potential.

- Foresight - Servant leaders are able to be aware of the possible future through their understanding of what is currently happening and what has happened in the past.
- Stewardship - By taking a visible responsibility for the role of leader, servant leadership carefully manages the organization and people and takes responsibility.
- Commitment to the growth of people - A priority of a servant leader is their commitment in the growth of individuals within their organization.
 - Building Community - By focusing on building community within their organization, servant leaders attempt to provide places and spaces where individuals feel safe and connected with others.

These characteristics are important when managing high-functioning and high-knowledge workers. These leadership characteristics are important in that they relate to decision making, especially by leaders where they are asked to make decisions in areas that they are not content or domain experts. Since servant leaders “place the good of followers over their own self-interests and emphasize follower development” (Northouse, 2016, p. 226), this leadership style lends itself to leaders trusting the professional advice and knowledge of the professionals they oversee. The servant leader is not the type of dominating leader, who claims to know more than their staff does.

The characteristics of a servant leader are similar in a constructivist leadership in that they “enable participants in a community to construct meaning and knowledge together. . . that, when individuals learn together in community, shared purpose and

collective action emerges – shared purpose and action about what really matters”
(Lambert, 2002, p. 42).

My research question examines the factors that influence academic library leaders' decision-making process regarding the adoption and ongoing support of technology initiatives, in this case IR systems, and is related to how people act in a given situation, in this case, it is their decision-making process. Argyris and Schön (1974) called these theories of action. The theory of action is actually composed of two contrasting theories of action. The first, theories-in-use, contributes to our actual behavior. The second, espoused theory, is how we describe or explain what we do. Incorporating the theories-in-use versus espoused theories is critical in not only understanding behavior but also in understanding that the results of any research on decision making, using an individual input through a survey or interview may result in measurement of the espoused theories and not necessarily the theories-in-use.

Leadership and decision making are closely interrelated, but are defined differently, with decision making being one skill needed as a leader. As this study examines technology implementation decision making, finding a working definition of decision making is important. For this study, I used Carroll and Johnson's (1990) definition of decision making as being,

...a process by which a person, group, or organization identifies a choice or judgment to be made, gathers and evaluates information about alternatives, and selects from among the alternatives. (p. 19)

Leaders are not only making individual decisions, but they are also making organizational decisions. Mintzberg, Raisinghani and Theoret (1976) examined decision making from an organizational standpoint. This pioneering work on unstructured decision making resulted in the idea that found that organizational decisions combine both group and individual factors. The factors and stages of the decision-making process have been explored in great detail.

Carroll and Johnson (1990) further explored the components or stages of the decision making process. Building on previous theorists (Einhorn & Hogarth, 1981; Engel, Blackwell, & Miniard, 1986; Huber, 1980), they have developed a list of seven stages that decision making that include (1) recognition; (2) formulation; (3) alternative generation; (4) information search; (5) judgment or choice; (6) action; and (7) feedback. (p. 15). Others have also theorized about decision-making through a linear process of stages and generally these are viable models where the decision-making process follows a rationale process and that decision makers are aware of and understand all the possible alternatives in a decision scenario (Lunenburg & Ornstein, 2004). These decision-making models can best work to describe where the process is linear and where there is stability in what is being decided upon (Dervitsiotis, 2007). Given the focus of this study on technology adoptions in higher education and the changing nature of technology in general, these models may not be necessarily compatible with decision making in more chaotic and fluid environments. Even with all the information or data available to make decisions, the decision makers may not necessarily use this information. Beach and Connolly (2005) found that:

Decision makers use only part of the information that potentially is available, both because they are cognitively limited and can handle only so much information at a time, and because there are resource constraints on acquiring complete information even if it is available. Decisions often are made when a sufficient option is encountered (called “sufficing”) rather than after a prolonged search for the best option. (p. 125)

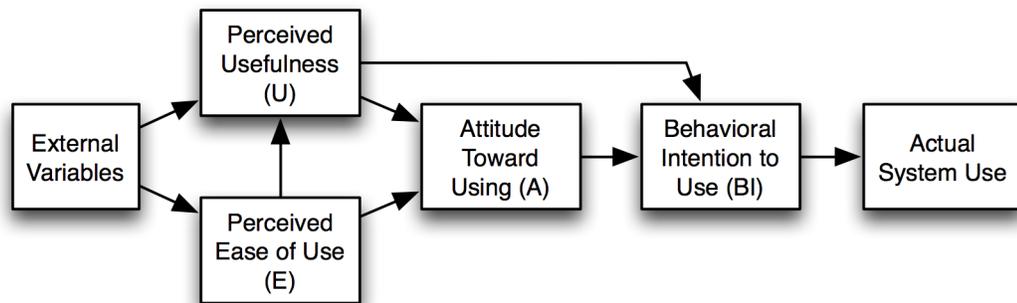
The fluid nature of emerging technologies results in additional complexity in the decision-making process for leaders. These ideas are supported by Senge (1990), when he not only mentioned emerging technologies, but also globalization, and other forces that lead to organizations that exist in increasingly complex and chaotic environments.

The literature review on leadership and decision making helped to create a deeper understanding of these terms and how they are linked to the goal of this study to increase existing knowledge and contribute to the understanding of the factors influencing academic library leaders in the adoption of IR systems within higher education libraries.

Technology Acceptance Model (TAM)

TAM Overview and History

As information technology has continued to become part of the normal aspects of both the commercial, home, and academic settings, so has trying to understand the dynamics from a leadership and managerial standpoint in how technology decisions are made. The Technology Acceptance Model (TAM), displayed in Figure 2.1, was first constructed by Davis (1986) in his PhD dissertation.

Figure 2.1*Technology Acceptance Model*

Note: Technology Acceptance Model (Davis, Bagozzi & Warshaw, 1989) (Reprinted with permission of the publisher)

The TAM is a widely used research model, with data gathered via a Likert based survey, that is used to understand individual use and acceptance of technology and information systems. Given the wide use of the TAM, it has been studied and verified across a range of different technology and information system scenarios (Surendran, 2012). Davis' (1986) basis for developing the TAM was done with two major objectives,

First, it should improve our understanding of user acceptance processes, providing new theoretical insights into the successful design and implementation of information systems. Second, TAM should provide the theoretical basis for a practical "user acceptance testing" methodology that would enable system designers and implementors (SIC) to evaluate proposed new systems prior to their implementation. (p. 7)

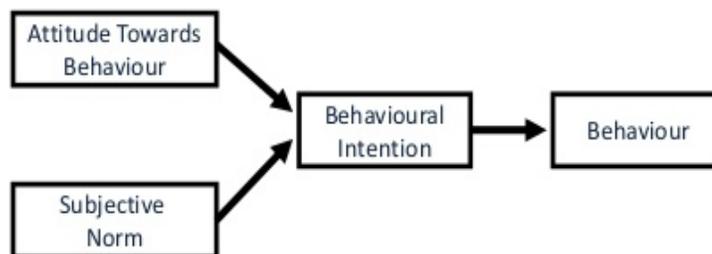
Davis et al. (1989) later identified the goal of the TAM was,

to provide an explanation of the determinants of computer acceptance that is general, capable of explaining user behavior across a broad range of end-user computing technologies and user populations, while at the same time being both parsimonious and theoretically justified. (p. 985)

Davis developed the TAM model from adapting the Theory of Reasoned Action (TRA), which is a social psychology model that is focused on identifying the determinants of consciously intended behavior (Ajzen & Fishbein, 1980; Davis, Bagozzi & Warshaw, 1989; Fishbein & Ajzen, 1975). The TRA was developed to understand a person's behavioral intentions, influenced by their attitude and their subject norm. Davis adapted the TRA into the TAM for examining a user's acceptance of technology in general. The TRA includes three components, the behavioral intention (BI), attitude (A), and subject norm (SN). Fishbein and Ajzen (1975) defined attitude within the TRA framework as "a person's general feeling of favorableness or unfavorableness for that behavior" (p. 6). They further defined the subject norm (SN) as the "perception that most people who are important to him think he should or should not perform the behavior in question" (Fishbein & Ajzen, 1975, p. 302).

Figure 2.2

Theory of reasoned action (TRA)



Note: Theory of reasoned action (TRA) (Fishbein & Ajzen, 1975).

In the TRA, the attitudes are understood to be a result of the behavioral beliefs, which are defined as “the person’s beliefs that the behavior leads to certain outcomes” (Ajzen & Fishbein, 1980, p. 8). Additionally, the TRA proposed that if an individual has the belief that conducting a behavior or action will have a positive result, they will in turn have a positive attitude regarding the behavior. (Ajzen & Fishbein, 1980). The TRA was subsequently adapted by other researchers, including Davis (1989) in the development of the TAM. The TAM has been considered a special use case derived from the TRA, because the TAM does not include a role for the TRA’s subjective norm (Taylor & Todd, 1995).

The TAM was an adaptation of the TRA, by Davis (1989), for the purposes of understanding user acceptance of information systems. Davis used two key components/beliefs of the TRA, the behavioral intention (BI) and attitude (A), and added to this the theoretical constructs of two additional main variables. Davis found that TAM’s two main variables were found to be important in the level of influence that have with system use and adoption. The first of these variables is perceived usefulness (PU).

Perceived usefulness, as defined by Davis (1989), is “the degree to which a person believes that using a particular system would enhance his or her job performance” (p. 320). The second of these main variables is perceived ease of use (PEOU). Perceived ease of use, defined by Davis (1989), is “the degree to which a person believes that using a particular system would be free of effort” (p. 320). These two variables are a reflection of the perception of a survey participant's perception about a given technology. Davis's additions of the PU and PEOU as theoretically important for the construct of the TAM were based on his analysis from a number of previous theories and research areas. These included: self-efficacy theory; cost-benefit paradigm (behavioral decision theory); adoption of innovations; and human-computer interaction research (Davis, 1989).

In the TAM, these perception variables affect the user's attitude toward using the technology and ultimately the outcome of the actual use of the system.

The theory behind the TAM is that the use of a technological system is guided or determined by an individual's behavioral intention (BI), which is influenced by both the attitude (A) towards using a given system and the individual's perceived usefulness (PU) of that system. This attitude (A) and behavioral intention (BI) relationship “represented in TAM implies that, all else being equal, people form intentions to perform behaviors toward which they have positive affect” (Davis et al., 1989, p. 986).

Validity and Reliability

As Davis originated the TAM survey instrument, he used a number of tests to verify the validity and reliability of the instrument he developed. Davis (1989) measured the validity of the TAM through the use of convergent and discriminant analysis using

multitrait-multimethod (MTMM) analysis and found that validity did occur. Davis (1989) further tested the validity of items of usefulness (U) and ease of use (EOU) could be found to form distinct constructs. This factor analysis also resulted in supporting the construct validity of the instrument.

The validity of the TAM through the use of factor analysis has been further studied. Hong and Walker (2015) used a confirmatory factor analysis to study Cambodian students' use of the Moodle learning environment for English language learning. Their findings supported the TAM's validity, and lent "support for the corroboration of TAM as a three-factor model consisting of perceived usefulness, perceived ease of use, and attitudes" (p. 22).

The reliability of the TAM was initially verified through the use of different tests. The perceived usefulness (PU) scale obtained a Cronbach alpha reliability of .97 and a .91 reliability for the perceived ease of use (PEOU). Davis (1993) and Venkatesh and Davis (1996) further verified the TAM's validity and reliability in later studies. In subsequent years the TAM's validity has been studied and reported on. Hendrickson, Massey, and Cronan (1993) tested the reliability of the PU and PEOU and found an Cronbach alpha reliability of .98 which backs up the findings by Davis (1989). Chutter (2009) reviewed literature that cited the original TAM research between 1985 and 2007 and found that these studies generally indicate that there is strong evidence that TAM is a useful instrument to use in predicting usage behaviour across a variety of technology use cases.

Use of the TAM in research

To date, the TAM has been used at the foundation for hundreds of studies involving user acceptance of technology (Chuttur, 2009; Lee, Kozar, & Larsen, 2003). Chuttur (2009) examined in-depth the origins, developments and directions of the TAM. He examined information system literature from a period between 1985 until 2007. In this period, he found more than 700 citations referring back to Davis' main research (Davis, 1986) that proposed the TAM. The TAM has been a variety of technology systems and technology adoptions. These include eLearning, e-commerce, communications, and banking (Surendran, 2012). From an extensive review of the literature it is difficult to find a major area of end-user based technologies that have not been studied through the lens of the TAM.

Limitations of TAM

In conducting research, it is important to understand the limitations of using a given instrument. The TAM is no different than other research instruments and has a number of limitations that have been identified.

The first major limitation of the TAM is that this model only studies self-reported behavior and does not measure actual technology adoption or usage. It does not measure actual technology usage. The TAM is a measure of usage intention and not the actual use of technology (Taylor & Todd, 1995).

Another limitation identified with the TAM is that it does not include the possible influence "from institutional, social, and personal control factors" (Elliot & Loebbecke, 2000, p. 49). Additional factors are also not accounted for including various economic

and outside market influences (van Akkeren & Cavaye, 1999). Given the nature of the TAM to measure the acceptance of a given technology, not measuring these other possible influences may limit our total understanding of the study results.

Since the TAM has been widely used for over three decades of technology user research, there are some researchers (Benbasset & Barki, 2007) who indicate that it may be a model that has been overused. Goodhue (2007) indicated that there is a need to explore other research models and instruments that examine user motivation beyond the PU and PEOU variables.

Given the TAM's known limitations, some researchers have conducted comparison studies with other research models. Chau and Hu (2001) compared the TAM to two other models, in their study of health care professionals in Hong Kong. They reported that the TAM was found to be better in explaining the intention of physician's to use telemedicine technology than the competing model of the Theory of Planned Behavior (TPB). Even with the identified limitations of the TAM, it continues to be used as a valid and reliable way of measuring individuals' acceptance of technological systems. Given the TAM's ability to understand influencing factors of technology adoption it will be used as the main survey instrument in this study that is examining the adoption and ongoing support of IRs. In order to better understand the various aspects of IRs they will be examined in greater detail in the following section of this chapter.

Institutional Repository

Within the past twenty years, there have been additional information technologies that academic libraries have adopted that have been brought about by the evolving role of

the library within college and university settings. Historically, academic libraries have been institutions that have collected monographs and journal materials to meet the researcher's needs. Before the internet and the development of digital content, once collected these materials were owned and controlled by the institutions that purchased them. With the dawn of the internet, publishers adapted their models when moving from a print-based to digital-based academic journal publishing model. This model moved from a subscribe-and-own model to a model that can be considered a subscribe-and-access model. This latter model takes the ownership and access control away from libraries and remains with publishers or vendors that resell these materials to libraries. Since these materials were largely from commercial publishers (Lynch, 2003), recent decades have seen issues arise with the dependence on these commercial publishers for materials, especially when it came to academic journals needed by researchers.

The for-profit nature of the commercial publishing industry has seen costs continually increased and library budgets were either cut or leveled off, libraries started to look for alternatives for providing research materials for their users (Pascarelli, 1990). These issues were some of the reasons behind a push for what is now known as open access licenses to content. As commercial publishers shifted to online delivery of journals, libraries looked to the possibilities of providing their own systems for disseminating research. Institutional Repositories (IR) are one of the technologies that libraries have implemented as a possible solution to these changing needs.

Defining an Institutional Repository

Although there are different types of repository systems implemented at libraries this dissertation will focus on the institutional repository as a specific type of repository. An institutional repository is defined as a digital library service which “capture(s) the original research and other intellectual property generated by an institution's constituent population active in many fields" (Crow, 2002, p. 3). Lynch (2003) later described IRs as not just a digital library service, but as;

...a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members. It is most essentially an organizational commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organization and access or distribution. (p. 328)

Looking at the IR as a set of services is one way in which to define what it is, another is by examining IR by looking at it as having features. This may just be semantics between the terms services and features, but it is important to mention. Gibbons (2004), for example, also examined IRs and identified five core features that made up IRs, including being made up of digital content; they are community driven and focused; institutionally supported; durable and permanent; and accessible content.

IRs, using the definitions above, are comprised of digital content. This academic content may include a variety of academic scholarship and other materials. IR's can provide faculty and students a system where they can store and share both research and teaching materials. These may include non-published research, data sets, and presentation

materials. IR also can provide a place to store the documentation of the record of events at any given academic institution (Hall, 2014).

Other studies of IRs have included an examination of what the core services of IRs are. Campbell-Meier (2008), in her case study research on the development of IRs, looked at the factors that have influenced the development of IRs. In her study, she identified a number of core functions of IRs. These core functions included both technical and non-technical aspects and are described by Campbell-Meier (2008), as including:

- Materials submission (how and what types of materials can be submitted to the IR).
- Metadata application (the use of either standard or loose standardized metadata for description of the content).
- Access control (a way in which content is controlled for access, either openly accessible or limited access).
- Discovery support (a way in which the content of the IR is exposed to the outside world and can be found).
- Distribution (the way in which the material is displayed to the user).
- Preservation (a way that content can be preserved)
- Resources (the acknowledgment that there are people involved in the development and ongoing management and maintenance of an IR).

Examples of IRs in academic and research libraries include the Digital Commons (<https://digitalcommons.hamline.edu>) at Hamline University, the University of

Minnesota's University Digital Conservancy (<https://conservancy.umn.edu/>), and the Institutional Repository at the University of Florida (<https://ufdc.ufl.edu/ufir>).

Although the core features are important when examining what makes up an IR and the surrounding support ecosystem, as the factors for adoption of an IR are important in this research study, it is important to look at the existing research on what are the motivating decisions that were influential in the push for adopting this technology. The Association of Research Libraries Spec Kits “combine the survey results and documentation from ARL member institutions to guide libraries as they address the ever-changing challenges facing libraries” (Association of Research Libraries, 2019). The Association of Research Libraries (Baily et al., 2006) published a Spec Kit on IR's and found that four top motivating factors in the establishment of IRs were to (1) preserve institutional scholarship, (2) increase global visibility of the institution's scholarship, (3) provide free access to an institution's scholarship, and to (4) collect and organize institution's scholarship in a single system (Baily et al., 2006, p. 25). Since there are multiple motivating factors and other influences that lead institutions to implement an IR, using the TAM to gather data on these may gather better insight into the weight that these variables play.

This section reviewed the existing literature regarding IRs which has allowed the researcher to understand how the technology has been deployed within academic and research libraries. This literature review was important in being able to link IRs to the specific TAM variables, which will be further reviewed below.

IRs Through the TAM Variables

As this research relates to the acceptance of technology, it is important to examine this technology through the lens of the variables found within the TAM research instrument framework. The dependent variable within the TAM is the adoption of the studied technology, the independent variables that will be measured in this study will be the perceived usefulness, ease of use, need, cost effectiveness, and reliability.

The dependent variable in this study is the adoption of an IR system. The current literature suggests that there has been continued growth of IRs during the past 20 years (Asadi, Abdullah, Yah, & Nazir, 2019; Priyadarshani, 2019). Lynch and Lippincourt (2005) examined the rate of deployments of IRs among research institutions (doctoral-granting) in the United States. Roughly half of these institutions were surveyed, with 80% responding. From those responding it was found that around 40% had deployed some type of IR, with 80% of the remaining responses indicating that they had planning underway for an IR deployment.

In a later study, Markey, Jean, Soo, Yakel and Kim (2008) found that among U.S. institutions, most of the institutions categorized as master's colleges and universities and baccalaureate colleges had not begun planning for IR implementations and services.

From extensively examining the available literature, there is a gap in the literature that fully examines the number of IRs in the United States. Dubinsky (2014) also reached this conclusion on the ability to find a numerical count of IR deployments. Dubinsky (2014) was able to determine some level of growth that was happening with IRs in the United States through the examination of the Directory of Open Access Repositories

(OpenDOAR). This site is a place where institutions can list their open access repositories. She found that this list included 413 repositories in North America in September 2009, with 515 being listed as of October 2013. A July 2017 examination of the OpenDOAR site included 607 North American listings (OpenDOAR, 2017). The growth in numbers listed in the OpenDOAR signifies a growth in the number of institutions wanting to publicize their IRs to a broader global audience. This large number of implementations, I feel, enabled a large number of potential survey respondents for this study.

TAM Variable - Perceived Usefulness

The first of the TAMs independent variables is perceived usefulness, defined by Davis (1989), as “the degree to which a person believes that using a particular system would enhance his or her job performance” (p. 320). The perceived usefulness of IRs varies depending on the literature examined and what they interpret as what they consider being the use of an IR. From the literature, one area of usefulness of IRs is to enable the library and librarians to actively take part in the scholarly communication process as it has become digital nature (Burns, Lana, & Budd, 2013; Carpenter, Graybill, Offord, & Piorun, 2011; Heath, 2009; Mower & Chaufy, 2009). Burns, Lana, and Budd (2013) proposed that the value that IRs enables researchers at academic institutions with the opportunity to participate in the scholarly communication process, with the additional benefit that academic librarians can further enhance the “discoverability of work through robust metadata and providing a permanent URI for that work” (p. 3).

Although this study will examine the perceived usefulness of IRs by academic library leaders, Tsakonas and Papatheodorou (2008) found that IR users surveyed found a positive response rate in their attitude towards these systems being useful to them. One area they found generally not satisfactory about IRs to users is in the amount of coverage or materials found within them. Given their study was done in 2008, the amount of coverage within IRs has expanded and this may not be seen as non-satisfactory as before.

TAM Variable - Perceived Ease of Use

The second of the TAMs independent variables is perceived ease of use (PEOU), defined by Davis (1989) as “the degree to which a person believes that using a particular system would be free of effort” (p. 320). Unlike many information technology systems, IRs are not only a system that is used or consumed by end users, but is also used as a workflow tool in the digital library/scholarly process. These systems have three distinct groups of users that interact with the systems. The first group is the librarians or staff which interact with the system on an administrative level configuring the system and interacting with user content in a technical manner for activities like editing content metadata, user account creation and maintenance. The second distinct users of these systems are users that have produced content that they are submitting for inclusion in the IR systems. The last of these groups of users are those that use systems as a discovery tool for finding and retrieving research content. These groups of users may overlap in how they use the system, but when examining the PEOU, it can be that systems that are easy for the user looking to discover content, may not have a high PEOU among users that are maintaining and administering the systems.

In reviewing the literature, there is limited research focusing on the ease of use or expected ease of use of IR systems. Rieh, Jean, Yakel, Markey, and Kim (2008) examined ease of use in their research on staff perceptions and experiences in the planning and implementation of IRs. Their research identified five areas of ease of use as related to IRs. These included (1) making it easy for people to contribute objects, (2) teaching contributors how to submit digital documents to repositories, (3) assisting contributors with initial setup, mounting, and workflow, (4) consulting with faculty members and encouraging them to create communities, and (5) informing contributors about copyright issues.

With the limited research conducted on IRs PEOU, I next examined some general themes that have come out of the research on PEOU of digital library systems. IRs exist within a larger category of technologies that have become known as digital library systems. From examining recent literature on digital library systems, the emergence of what is called usability has become researched in greater detail. Usability is either considered a synonym for ease of use or in some cases ease of use is seen as a component of a broader concept of usability. In cases where usability is seen as a broader term, the components have been found to be ease of use, terminology, navigation, aesthetic appearance, and learnability (Ebenezer, 2003; McMullen, 2001).

TAM Variable - Perceived Need of IRs

Academic libraries and academic archives have evolved throughout their history to fit the changing needs of their parent institution. The institutional archive, either as a part of the academic library or as a stand alone entity on campus, played the historic role

of preserving the institutional records. Hamline University Bush Memorial Library, for instance, has implemented an IR and has branded this service the Digital Commons@Hamline. They state that the Digital Commons@Hamline is,

Hamline University's open access institutional repository highlighting student and faculty scholarship. By providing free and open access to scholarship, Digital Commons@Hamline connects Hamline's intellectual output with the worldwide academic conversation. A service of the Hamline University Library and Archives, Digital Commons@Hamline preserves and promotes scholarship at Hamline. (<https://digitalcommons.hamline.edu/>, retrieved 3/29/2018)

As is stated in the service description, the IR fills a need in preserving, providing access to, and for the promotion of scholarship of both students and faculty of Hamline University. Hamline University is not unique in determining that the IR and digital library systems are the response to filling these research needs. Hamline University is currently classified in the Carnegie system as a M1: Master's Colleges and Universities – Larger programs institution (Indiana University Center for Postsecondary Research, 2017). This classification means that Hamline University is still not classified as a research institution, yet there is still an identified need for an IR for the scholarly output of the University. Since the research output may not be as large at a relatively smaller institutions, like Hamline University, the motivation and need for an IR arise to potentially support the teaching and learning that takes place at these institutions, rather than as a way to quantify and measure the output of the scholarly activity (Rogers-Urbaneck, 2008).

At large research institutions, this need to provide a service to preserve and provide access to the scholarly output of the university can be seen to provide a more encompassing role (Burns, Lana, & Budd, 2013). Research institutions like the University of Michigan, for example, have created a large and robust IR environment that has cemented its place in the institution. At larger research institutions, the ability to control and measure the scholarly and intellectual output is one benefit that may arise through the use of an IR (Branin, 2005; Goodyear & Fyffe, 2006). This need to preserve the scholarly output has been expanded as the role of the library changes to the needs of the researchers on campus. The University of Michigan has expanded their IR, which is called Deep Blue (University of Michigan, 2018), to not only include the normal textual output, like journal articles, dissertations, and thesis but now has expanded to include the ability to include the research data that researchers have accumulated throughout their studies. As granting agencies require researchers to include data management plans, that include the ability to retain the research data, libraries are finding a new role in working as a central place on campus to meet this need. Not only are libraries providing a place to preserve research data, but librarians and information professionals are finding a role in helping researchers understand data management and comply with funder mandates on data management (Lyle, 2017). These mandates from funders can include, not only a requirement for a data management plan, but within this is a need to archive and store the data and other research outputs, which further increases the need for an IR (Harnad & McGovern, 2009).

TAM Variable - Cost Effectiveness of IRs

The fourth independent variable being examined in this study is that of cost effectiveness. As a technology manager throughout my career, the importance of the overall cost of a service or technology is one of the key factors in making decisions to adopt or continue the use of these resources. In a study using cost effectiveness as an independent variable, Cox (2013) defined cost-effectiveness as being a service or process that “achieves its objectives at a minimum cost” (p. 60).

Cost effectiveness of an IR implementation, as a variable, is two fold. First there is the actual cost of operating and staffing the technology itself. The second is the potential cost savings that an IR can have in offsetting other costs or cost increases the libraries have with resources or services that an IR can help to mediate. The costs associated with implementing the actual IR service will first be examined.

The actual dollar costs of implementing and operating an IR will vary depending on the IR software, the hosting platform, and the model for staffing and operating the IR. The software related costs for operating an IR will largely depend on if you are using a commercial system or an open source solution. In recent years the information technology landscape has shifted from largely on-premise hosting of systems, to these systems being offered as Software as a Service (SaaS). Both commercial systems, plus some open-source IR systems are being offered via a SaaS model, so even if the open-source software is technically free, the service provider will charge for the hosting and service costs of providing the IR system for an institution (Bankier & Gleason, 2014).

IRs along with other new technologies and services that are offered by a library, which are not an adaptation of existing services, do not have an existing stream of funding that can be leveraged to fund the IR service. Since IRs are widely deployed by academic libraries, there has been research into where the start up funding for these services has come from or anticipated to come from, for those libraries still in the planning process. Rieh et al. (2007) conducted a broad survey of academic libraries focusing on various aspects of IRs, including costs and sources of funding. The top four responses about the sources of funding included, (1) special initiative supported by the library, (2) costs absorbed in routine library operating costs, (3) regular budget line item for your institution's library, and (4) being grants awarded by an external source. These sources of funding were similar for those libraries that were either in the preliminary planning, the pilot testing, or full implementation phases of an IR implementation. Since the Rieh et al. (2007) study, IRs have become more commonplace as a service of academic libraries which has seen a transition to being a part of the normal operations budget of the library. Their study, however, examined other aspects of costs of IRs and found that costs associated with staff and vendor fees represent about 75% of the budget allocated to running an IR.

When examining costs associated with an IR, staffing is a large part of current and future/ongoing costs. Academic libraries have implemented a variety of staffing and support models for their IR implementations. At one end of the staffing model is an approach where all content that is ingested into the IR is mediated at some point by library staff. At the other end of the spectrum is a model where the content researcher or

author at an institution is the one that is self-submitting or self-archiving the content. These two submission models will largely guide the different staffing costs associated with the IR (Bevan, 2007; Burns, Lana, & Budd, 2013; Giesecke, 2011). Other services that can contribute to the costs of an IR are if an institution offers digitization services for content that is not yet in a digital form (Piorun & Palmer, 2008) and any copyright consultation or vetting services (Li & Banach, 2011).

The actual dollar figures for costs of implementing and operating an IR have been studied a number of times throughout the years, although there have not been any studies conducted in recent years. Giesecke (2011) estimated that the costs associated with the implementation of an IR range between \$130,000 to \$248,000 per year, depending on factors that included staffing, types of services, types of systems used, and costs associated with the preservation of data. Since this time, many factors could have changed these cost figures. An important factor to consider is that the types of materials that are being stored in IRs are also changing from digitized textual based or print-based items, to now including a variety of audio and video formats, as well as research data sets, and 3D modeling data (Luther, 2018). As many institutions have moved from an early stage implementation stage to a more mature service provided by the library, these costs are being incorporated into the ongoing budgets of the library, since this tends to be the operational home of institutional IRs.

TAM Variable - Perceived Reliability

The fifth of the TAMs independent variables, being examined in this study, is perceived reliability, defined by Cox (2013), as “The dependability and availability of a

given technology” (p. 12). Reliability of technology is a key factor in IT management and is defined within the ITIL (Information Technology Infrastructure Library) framework as being - can be further defined as being determined by the “the availability of resources to ensure that business needs are met are tested on a regular basis” (Cox, 2013, p. 61).

Given that the goals of institutional repositories is a commitment to making accessible, preserving, and safeguarding the research and institutional content found within it (Burns, Lana, & Budd, 2013), and in the digital library and archivist fields reliability is a term that can be used to refer to both the expectations of the IR service and the requirements of the technology systems being used (RLG/OCLC Working Group on Digital Archive Attributes, 2002).

The concept of reliability is further defined by those implementing repository systems, as having a set of criteria that can be used to determine the level of reliability or trust that one can have with a given IR software or service that is provided by an institution. This work has led to the development of a process titled Trustworthy Repositories Audit and Certification (TRAC) which includes a set of criteria and a checklist that an institution can use to audit their own system to see if they meet a minimum set of criteria of a trusted digital repository. This trusted digital repository is defined at a high level as being able “to provide reliable, long-term access to managed digital resources to its designated community, now and into the future” (RLG/OCLC Working Group on Digital Archive Attributes, 2002, i.). The importance in providing reliable access to content and a stable and long-term environment for digital library content is an ongoing concern for library administrators and can result in significant

changes to technology architecture and additional costs if these systems are not sustainable (Digby & Durant, 2020). For this study reliability or the concept of reliability is important in being able to measure to see how it factors into the decision to implement an IR at an academic institution.

In order for the TAM to be applied to a specific technology implementation, there needs to be a clear connection with the independent variables, discussed above, and the technology studied. As demonstrated, the TAM's independent variables are a part of the specific implementations of an IR at an academic institution, which makes it a fit to be used as a research instrument for this study. Additionally, this research has helped formulate the needed changes to the language used in the TAM survey questions to customize it for the study of IRs.

Summary of Chapter

This chapter has reviewed a number of areas and topics that are important as foundational concepts to both the research topic and the research instrument being used. Given the nature of this research and the focus on academic library leadership and decision making, this chapter includes a brief overview of leadership styles and how these may affect decision making. The primary research instrument for this study, the TAM, was a focus of this literature because it is necessary to examine the history and nature of using this instrument to determine the appropriateness for use in this study, as well as, to determine the acceptance of this model's use within the academic and research community. Finally, this chapter examined the history, development, and current state of academic Institutional Repositories examined through the lens of the TAM model. The

review of the literature focused on the survey instrument (TAM), leadership and decision making, and the IR, was important in supporting the research questions being asked, in order to help formulate the research survey and interview collection and to better understand and analyze the data received. The next chapter will review the research methodology being used for this study.

CHAPTER THREE

Methodology

Introduction to Methodology

This chapter reviews the research methodology used in this study, including a discussion of the rationale for the research methods being used. Using a mixed method research approach, the goal of this study is to examine the influencing factors of why academic library decision-makers adopted institutional repository (IR) systems, utilizing the technology acceptance model (TAM) by Davis (1989). To fully examine the research question, the TAM survey instrument that was used examined the variables of perceived usefulness, perceived ease of use, need, cost-effectiveness, and reliability of IRs. The goal of my research is to improve upon existing knowledge and contribute to the understanding of the factors influencing the adoption of IR systems within higher education libraries. This will be done by utilizing the TAM survey instrument to collect academic library decision makers' perspective, followed by conducting semi-structured interviews with senior academic library leaders to further examine the survey results and their own influences in adopting an IR at their institutions.

The primary subject of this research is to study the factors that influence academic library leaders in the decision to adopt a new technology or system, with the IR being the specific technology being examined in this study. Given the complexities of decision making and the long-term commitment and expense related to implementing new technology systems, understanding better the guiding factors that influence these decisions is important for those that manage and support these technologies. In order to

study this topic, a survey of academic library leadership was conducted based on the Technology Acceptance Model (TAM) and will specifically ask questions related to the adoption of IR systems at their academic and research libraries. In addition to using the survey data, there was additional data gathering in the form of semi structured interviews conducted with three senior academic library leaders to reflect upon the results of the survey compared to their own experience. Therefore, it is the hope of this survey and subsequent interviews to better understand the factors that influence the technology adoption decisions of academic and research library leaders.

Rationale for Research Method

In using a sequential explanatory research design, both quantitative and qualitative data gathering techniques are used and are “implemented in two phases, with the primary emphasis on quantitative methods” (McMillan & Schumacher, 2010, p. 401). Given the weight on the quantitative nature of this study, I first used a widely used quantitative research instrument known as the Technology Acceptance Model (TAM). Surveys are an important tool in gathering quantitative data and as stated by Fink (2013) “are information collection methods used to describe, compare, or explain individual and societal knowledge, feelings, values, preferences, and behavior” (p. 2).

In my case, I used the TAM survey instrument, a previously-validated survey framework (Carper, 2015; Taylor, 2019; Wright, 2018), to measure a user’s levels of technology acceptance. Since the initially developed TAM instrument does not include exact variables that are being measured in my questions, an adapted and validated TAM

survey (Cox, 2013) will need to be used that better aligns to the research question that I am studying.

This research will be conducted using a convenience sample of higher level academic library deans/directors and library information technology directors at mid to large size institutions with student enrollments over 10,000 FTE (Full-time equivalent). In selecting institutions of this size and research focus, there is a higher likelihood that these institutions will have implemented or have planned on implementing an IR at their respective institutions. Potential survey respondents were solicited via email, and the survey will be conducted online using the survey tool Qualtrics.

By using this research design, it is my hope to broaden the knowledge in the field and bring about a better understanding of how leaders at different levels or expertise levels differ in their approach to technology decision making, specifically about their IR, at their respective campuses.

Survey Research Design

To answer the questions of whether or not the factors of usefulness, ease of use, need, cost effectiveness, and reliability influence academic library leaders' decision making process regarding the adoption and ongoing support of technology initiatives, in this case, IR systems, the survey section of this research study used a non-experimental, quantitative survey research design approach. A non-experimental research design, defined by McMillan and Schumacher (2010), is used to “describe phenomena and examine relationships between different phenomena without any direct manipulation of conditions that are experienced” (p. 22). There are various types of non-experimental

designs that have been identified. In this case, the non-experimental research design being used is a survey. Survey research designs are when sample subjects are administered a questionnaire and this type of research design is “frequently used in educational research to describe attitudes, beliefs, opinions, and other types of information” (McMillan & Schumacher, 2010, pp. 22-23).

The research data for the TAM was gathered using a cross-sectional survey design that used an email invitation to complete an online survey. According to Connelly (2016), a cross-sectional survey design “can be considered a snapshot that gives a picture of what the researcher wants to study” (p. 368). In this type of design, the survey acts as a snapshot across a group of individuals. In this case, the survey acts as an instrument to gain insight into the factors that influence library decision-makers in the adoption of institutional repository software and systems.

The TAM has been used widely across many fields to study technology adoption. Cox (2013) identified over 146 studies that have used the TAM as a way to evaluate the factors that influence technology adoption. A review of the literature has found that this instrument has not been used to examine the influencing factors in academic libraries’ adoption of IRs.

This study used as a model the TAM dissertation research conducted by Cox (2013) for his study titled a *Factors influencing adoption of information technology infrastructure library: Utilizing the technology acceptance model (TAM)*. His study included the extended TAM independent variables of need, cost-effectiveness, and

reliability. My use of the TAM included these same extended TAM independent variables.

Survey Target Population

The respondents to the survey, or sample, included academic library leaders. This type of survey sample is known as a purposive sample, or also as a judgmental or expert sample, and is a type of nonprobability sample (Lavrakas, 2008). The objective of this type of sample is that it can represent a known segment of the population and it is created or formed by using expert knowledge of a given population to select a sample that is nonrandom and represents the required segment of the population to best respond to the research questions (Lavrakas, 2008).

In determining the research sample for this study, I gathered names and contact information for academic library leaders and decision makers at a Dean/Director, or Assistant University Librarian, Assistant Director level using the Carnegie classification system, from Doctoral granting institutions. More specifically, the institutions focused on for this study are designated doctoral granting institutions at the Very High Research Activity (R1) or as High Research Activity (R2) (Carnegie Classification of Institutions of Higher Education, 2020).

As previously stated, these types of institutions were selected because given the increased levels of research activities, at least at the Doctoral level, there is a higher likelihood that these institutions may have implemented IR systems.

As mentioned, the target population, those that will be surveyed for this study, are academic and research library decision-makers. For this study, these individuals consist

of the lead library decision maker, which have possible titles of library Dean, Director, or University Librarian. Additionally, the second tier of decision makers in the organizational hierarchy will also be surveyed. The position titles generally used for this level of library administrators are usually Associate or Assistant Deans, or Associate or Assistant Library Director, Associate University Librarians, or Department Chairs Department Directors. This study surveyed the top library technology decision maker in the chosen academic institution, which may have one of these previously mentioned titles, or they may have a different title depending on how the library administrative hierarchy is structured.

The total number of institutions that are currently categorized as R1 and R2 Doctoral granting institutions is 262. For each of these institutions, there are approximately five individuals that can be classified as the dean/director or in the second tier of library administrators and decision makers. This totals an estimated target population of around 1000 that was surveyed. Since 100% of the target population being sent a survey was not expected to respond, it was important to calculate the minimum sample size needed to adequately conduct the needed statistical tests for the research instrument being used.

Survey Minimum Sample Size

An important aspect of conducting quantitative research is the number of respondents participating in the study or the size of the sample (Fink, 2013). In quantitative research, the aim of the researcher is to include the appropriate number of subjects to present study results that are credible (Onwuegbuzie & Collins, 2007). In

quantitative research, “the number of independent, individual units of study becomes the sample size, represented by the letter n ” (McMillan & Schumacher, 2010, p. 141).

Determining the appropriate sample size is determined by three factors. These factors include the power, or the probability of finding a significant relationship, the number of independent variables, and the effect size, which can be defined as “the magnitude of some phenomenon that is used for the purpose of addressing a question of interest” (Kelley & Preacher, 2012) .

Using a tested and verified online statistical calculator (Soper, 2019), the *A-priori Sample Size Calculator* was used as a method for determining the needed minimum sample size for this study. In this study, there will be five independent variables used by the TAM to study IR adoption including need, cost-effectiveness, reliability, PU and PEOU. The model used gives a medium effect size of 0.15, which will detect the significance level of 0.05. With a recommended power level of 0.80, the minimum sample size that was calculated is 91. With 143 fully completed survey responses, the minimum sample size was met and given the increased number of responses helps increase the significance of the results.

Survey Research Setting

The population of the study is academic library leadership who, given their positions, have been involved in the decision making process within their respective institutions. Privacy and confidentiality are a key belief within academic libraries and this study reinforced these ideas by protecting the privacy and confidentiality of survey responses. The survey responses were anonymous and this was made clear in the survey

participation terms of consent. The survey was conducted using the Qualtrics survey system and respondents were free to stop the survey at any time and only fully completed surveys were included in the research data being studied.

Survey Research Questions

This study researches five questions that are investigated, which aligns with both the purpose of this study and the existing survey instrument, the TAM, that has been used extensively in the past. Each of these questions measures a specific perspective of academic library leadership's perception as it aligns with the adoption of an IR: perceived usefulness, perceived ease of use, cost-effectiveness, and reliability.

This study will include one dependent variable and five independent variables. This is consistent with how previous studies have used an extended TAM and is modeled after Cox's (2013) study using these same variables to research factors that influenced the adoption of information technology infrastructure library (ITIL). Since all the potential survey respondents work at institutions that already have adopted an IR, the dependent variable for this study will be an affirmative response for all respondents. The specific variables are displayed in Table 3.1.

Table 3.1*Study dependent and independent variables*

Variable	Variable Type
Adoption	Dependent Variable
Perceived Usefulness	Independent Variable
Perceived Ease of Use	Independent Variable
Need	Independent Variable
Cost Effectiveness	Independent Variable
Reliability	Independent Variable

Survey Research Instrument

The research survey instrument that will be used in this study is based on Cox's (2013) and Tadesse's (2012) research and can be found in Appendix A. Tadesse (2012) was able to use a Cronbach alpha (α) to find out the internal consistency between the independent variables used in his study (PU, PEOU, cost-effectiveness, and security-effectiveness), which resulted in an alpha coefficient scores .869 to .982. These results demonstrated a psychometric score higher than .70, which Davis and Venkatesh (1996) indicated is needed for stronger internal consistency.

This research study uses a survey that is separated into six sections. The first five sections relate to each of the TMA variables. The survey uses a five-point Likert-type question format to gauge and measure the survey participant's responses for each question. Like previously used TAM studies, the five-point scale measures respondent's responses from Strongly Agree on one end of the scale to Strongly Disagree on the other

end of the scale. The sixth section is a demographic section used to gauge a respondent's level of experience, library type, and involvement with IR.

Potential survey participants were contacted via their institutionally identified email addresses and included a link to the survey (see Appendix A). The survey was conducted with the online survey tool Qualtrics. Qualtrics is also the tool used to send the emails out to the potential survey respondents and houses both the survey questions and online form, as well as, collects the responses in a secure environment that protects the respondent's answers. Prior to the respondents completing questions in the survey, they were required to read and agree to the research consent form.

Survey Instrument Testing

A pilot test of a survey is an important step in the development and deployment of a survey and according to Fink (2013) is a necessary step that must be followed before a survey is put into practice. This testing helps produce a survey that is clear and will help the researcher understand where the participants understand the questions and answers (Fink, 2013). The pilot testing is also important in that it allows the researcher to not only test the language of the survey questions and answers, but also to test the mechanics of the testing instrument.

The pilot test of the survey instrument was done after the Institutional Review Board (IRB) approval. This pilot stage of the survey included presenting the draft survey questions to five individuals that have experience in academic and research libraries. The pilot test included a review with these individuals to ask them to provide input and feedback on the survey. The results of this pilot testing included minor modifications to

the survey questions, but there were not modifications to the online survey tool being used.

Survey Data Collection

Data collection involved the use of the online, web-based Qualtrics survey tool. The Qualtrics tool enabled a templated email (see Appendix B) to be sent to potential survey participants, whose email addresses have been pre-populated into the system. This email included a link to the survey and also included information about the survey. Participants were able to complete the survey without needing to enter any account login information. The Qualtrics tool allowed a follow up email reminder to possible participants who have not yet completed the survey. One additional follow-up email was sent two weeks after the initial email invitation was sent. As the data was collected the researcher was the only person who will have access to the Qualtrics account and the list of potential participants. Survey data collection was initiated after IRB approval and took place during a one-month period during January 2021.

Survey Data Analysis

A limited number of statistical techniques and approaches were utilized in this research study to analyze the data and link it to the research questions. These techniques and approaches align with previous data analysis that has been used when using the TAM instrument. The Qualtrics survey tool that is used in the data collection of this research, exported the survey data as a file type that was able to be imported into SPSS. SPSS was the statistical analysis software that was to be used for conducting the complete data analysis of the research study.

Like previous uses of the TAM research instrument (Cox, 2013), the survey was analyzed using statistical tests to determine the reliability of the questions using a Chronbach alpha test. The survey responses were further analyzed to produce total mean based scores for each variable question section and for each individual question, which is further analysed in Chapter 4..

Demographic question response data was used as a way to provide a summary of the survey participants and their involvement, oversight authority and financial oversight of IRs within their respective institutions.

The potential issues relating to missing data was minimized through requiring each question to be answered and if surveys were only partially completed they were not included in the data analysis. In this way, the data analysis will not need to account for any missing data elements.

Survey Data Validity

A critical aspect of a quantitative research study is the validity of the instrument being used, as McMillan and Schumacher (2010) defined test validity as “the extent to which inferences made on the basis of numerical scores are appropriate, meaningful, and useful” (p. 173). The TAM test has been validated by previous researchers, Davis (1989), Davis and Venkatesh (1996), and Tadesse (2012).

Qualitative Semi-Structured Interviews Research Design

The qualitative interview was used in this study because it “attempts to understand the world from the subjects’ point of view, to unfold the meaning of their

experiences, to uncover their lived world prior to scientific explanations” (Kvale & Brinkmann, 2009, p. 1.).

After analyzing the results of the survey data gathered through the quantitative survey results, I then used these results to construct questions that guided the semi-structured interviews with academic library leaders to obtain additional data to answer my research questions.

There were four interview questions that were developed, found in Appendix D, which were purposely structured in a way to encourage discussion about the interviewee’s own experience and ideas, as well as, more specific questions regarding their feedback on the results of the survey.

Interview Setting and Participants

Participants that took part in these interviews were senior academic library leaders who currently have the top library leadership at their respective institutions, which are considered as R1 institutions in the Carnegie classification system. Additionally, these are individuals who I know and have either worked with or have served at a national library association with. The respondents to the survey, or sample, included academic library leaders. This type of survey sample is known as a purposive sample, or also as a judgmental or expert sample, and is a type of nonprobability sample (Lavrakas, 2008). The objective of this type of sample is that it can represent a known segment of the population and it is created or formed by using expert knowledge of a given population to select a sample that is nonrandom and represents the required segment of the population to best respond to the research questions (Lavrakas, 2008).

Interview participants were sent an invitation email with a link to an online consent form. Each participant completed the consent form before the interview process started. The interviews were conducted using Zoom and the interviews were recorded and auto-transcribed using the Zoom platform. Once final corrected transcripts were produced, the original audio recordings were deleted so that the participants' confidentiality was preserved as outlined in the research protocol agreed to in the IRB.

Interview Pilot Testing

The interview questions were pilot tested and improved by an academic librarian in a leadership position at an R1 institution. The pilot testing feedback resulted in a slight change in the order of the questions to aid in the flow of the interview discussion as well as certain grammatical corrections.

Interview Data Analysis Methods

The semi-structured interview component of the study was analysed using the qualitative research approach of grounded theory to analyse the collected interview data. Grounded theory, as defined by Strauss and Corbin (1990) as “a qualitative research method that uses a systematic set of procedures to develop an inductively derived grounded theory about a phenomenon” (p. 24). The analysis of data in the grounded theory approach, as discussed by Maxwell (2013), is done using three main categories. These include coding and thematic analysis, narrative analysis, and memos and displays. This study is using inductive coding as a method for understanding the data presented in the interviews.

Once the interviews were conducted, a transcript of each interview was generated using the automatic transcription provided by the Zoom web conferencing system. The researcher then listened to the interview recordings and made corrections to any errors that were present in the automated transcription. After the transcripts were corrected the Atlas.ti software system was used as a coding system for the interviews. Atlas.ti is a well known qualitative analysis system that is used “to help researchers uncover and systematically analyze complex phenomena hidden in unstructured data (text, multimedia, geospatial)” (Atlas.ti, Wikipedia, 2021).

The first round of coding that was done to start my analysis of the interviews used a concept coding approach. I coded the interviews using the five different concepts that were presented as technology acceptance factors that were presented as survey questions in the TAM survey portion of this study, including the survey’s independent variables which included perceived usefulness, ease of use, need, cost effectiveness, and reliability. Using these concepts for coding allowed me to understand how the interviews aligned and supported the results found in the survey data. Following up on this initial round of coding, I conducted a second round of coding in which I examined the transcripts to discover additional influences and factors in the adoption of the IR that were not covered in the TAM survey. Final reviews of the transcripts were done to identify any relevant quotes that help further tell the story about IR and other library technology adoptions. Results of the finding of the coding are discussed in chapter 4 of this study.

Ethical Considerations for the Overall Research Design

Although the risks of participating in this dissertation are minimal, it is important to note that when conducting any research there are important ethical considerations that must be taken into account. This research study uses a survey and semi-structured interviews as the data collection mechanism and according to Fink (2013) the ethical considerations about respondent's privacy and confidentiality are paramount.

Two core aspects of ethical considerations in any quantitative research, as discussed by McMillan and Schumacher (2010), are that participation in the research is voluntary and that they have informed consent. Participants were provided with a consent form that presented the risks and provided an explanation for this dissertation. The survey participation was voluntary and participants were allowed to decline the consent or they were able to additionally rescind their consent at any time during the study without consequence. If participants did not complete the survey, the data was not used in the survey and was deleted from the data source.

The survey was conducted using the Qualtrics survey system which was used to both present the consent form, and subsequent survey data to the participants. The researcher is the only individual with access to the data and once the study was completed, the data was removed from the Qualtrics system and stored on an approved long term research data storage system.

Approval for Research

With all the research that is conducted with human subjects, it is necessary for the study to undergo a review by an Institutional Review Board (IRB). Since this research is

being conducted for a degree at Hamline University, IRB review and approval process can take place using the Hamline University IRB. Institutional Review Board on October 11, 2020. All survey respondents and interviewees were provided with the IRB approved consent forms which they agreed to before starting the survey or participating in the interview process.

Summary of Chapter

This dissertation explores how academic library leadership and decision making about the adoption of new library systems and services, with a specific focus in this study with the adoption of Institutional Repositories within their organizations. This study will use a quantitative research method and will utilize the technology acceptance model (TAM) by Davis (1989). The researcher has verified this approach as being valid and has been used to conduct similar studies in the past. The research instrument will undergo a pilot test to determine the ease of use and appropriate understanding of both the structure and nature of the research questions. Although the risks of participating in this dissertation are minimal, appropriate ethical considerations, including obtaining IRB approval to conduct the study, participant confidentiality and informed consent, and data security are presented.

CHAPTER FOUR

Results

Introduction

This chapter presents the results from the survey conducted on the technology acceptance factors affecting the adoption of institutional repository (IR) systems by academic library leaders. This is followed by presenting the qualitative data from the semi structured interviews that were used to address the research questions that examine the factors of usefulness, ease of use, need, cost effectiveness, and reliability influence academic library leaders' decision making process regarding the adoption and ongoing support of IR systems.

TAM Survey Data Analysis and Results

The study was carried out during the month of January, 2021 using the online survey tool Qualtrics. A total of 986 participants were emailed the survey link, of which 174 responses were received. The survey participation was voluntary and confidential. Prior to the statistical analysis, the responses were initially screened to remove unfinished responses. This resulted in 31 partially completed surveys to be removed before statistical analysis was performed. This resulted in 143 fully completed surveys, which resulted in a return rate of 14.5%.

Given the nature of this research study that combines both survey results, that influenced the semi-structured interview section, a full TAM based statistical analysis, that usually includes a number of deeper statistical analysis and testing that related all the

factors against each other was not completed. The TAM variables were examined individually, to determine the importance of these variables for survey participants.

TAM Survey Reliability Statistics

The first statistical test that was needed to be performed on the results was a Cronbach's alpha reliability analysis. A Cronbach's alpha reliability analysis is used to examine the internal consistency for the five question grouping and the nineteen multidimensional attributes in the survey instrument. Since each area had multiple questions that pertained to it, this type of analysis is needed to ensure that the questions are reliable in their ability to answer the question area. In this study, the Cronbach's alpha were computed using questions pertaining to the questions on the survey for the perceived usefulness scores, perceived ease of use scores, need, cost-effectiveness and reliability scores. As the data listed in Table 4.1 show, the Cronback alpha scores were reliably related to each other with values ranging from 0.605 (Reliability) to 0.826 (Need). The following Cronbach's alpha reliability coefficients were obtained for these factors: perceived usefulness 0.743, perceived ease of use 0.81, need 0.826, cost-effectiveness 0.822, and reliability 0.605. There is a generally accepted rule that results of between 0.6-0.7 indicate an acceptable level of reliability, and those that are 0.8 or greater indicate a very good level (Ursachi, Horodnic, & Zait, 2015). From this analysis it appears that the Cronbach's alpha reliability scores indicate that the survey is valid for respondents subjected to these survey instruments.

Table 4.1*Reliability Analysis of TAM Factors*

TAM Factor	Cronbach's Alpha	N of Questions Per Factor
Perceived Usefulness	0.743	5
Perceived Ease of Use	0.81	5
Need	0.826	3
Cost-Effectiveness	0.822	3
Reliability	0.605	3

Note. These values mostly meet the minimum reliability score of greater than 0.60, which indicates an acceptable level of reliability.

Demographic and Non-TAM gathered survey information

Demographic information gathered was kept to a minimum for this study and only included a question asking them to identify the job title they hold in their current position within their academic library. Additionally, the question was asked about if they have technology related decision making authority for the library and if they have oversight of the IR for their respective libraries.

The largest group of respondents consisted of those individuals that identified as having the title of Assistant/Associate Dean of Libraries, Assistant Library Director, or Associate University Librarian which constituted 36.4% of respondents. The next largest group consisted of Department Chairs or Department Directors which made up 28.7% of the total respondents. Additional demographic details can be found in Table 4.2 below.

Table 4.2*Demographic characteristics of the respondents.*

Position Title	Number	Responsible for Library Technology related decisions?	Oversight of your institution's Institutional Repository system?
Dean of Libraries, Library Director, or University Librarian	25	Yes - 10 No - 15	Yes - 7 No - 18
Assistant/Associate Dean of Libraries, Assistant Library Director, or Associate University Librarian	52	Yes - 18 No - 34	Yes - 20 No - 32
Department Chair or Departmental Director	41	Yes - 5 No - 36	Yes - 17 No - 24
Other	25	Yes - 2 No - 23	Yes - 12 No - 13
Totals	143	Yes - 35 No - 108	Yes - 56 No - 87

Summary of TAM Survey Results

The TAM survey consisted of 19 total questions that were each focused on one of the independent variables being researched. Perceived Usefulness and Perceived Ease of Use consisted of five questions each. Need, Cost-Effectiveness, and Reliability consisted of three questions each. The full survey questionnaire can be found in Appendix A. These questions were asked using a five point Likert scale which included a possible range from strongly agree, agree, neutral, disagree, and strongly disagree.

Results were then reverse coded in SPSS so that the strongly agree was presented as a higher number and strongly disagree was presented as a lower number. This resulted in

the higher numbers representing a more positive or agreeable response to the question that is presented. The mean results for the five influencing factors can be found in Table 4.3 below.

Table 4.3

Summary Statistics for TAM Factors for question totals

Factor	N	Minimum	Maximum	Mean
Perceived Usefulness	143	1	5	3.668
Perceived Ease of Use	143	1	5	3.322
Need	143	1	5	4.2
Cost-Effectiveness	143	1	5	3.46
Reliability	143	1	5	3.73

Results for the Questions Relating to Each Survey Factors

Perceived Usefulness.

The factor of Perceived Usefulness was examined using five survey questions that combined had a mean score of 3.668. The question within the Perceived Usefulness factor which resulted in the highest favorable response, with a Mean of 4.31, by survey participants was related to the use of the IR system enhances the value of the library within their institution.

The question within the Perceived Usefulness factor which resulted in the lowest favorable response, with a Mean of 3.27, by survey participants was related to the use of the IR system to allow the staff of the library to increase productivity. This was closely followed by With closely followed, with a Mean 3.31, that using the IR system makes it

straightforward for users to locate the materials they are seeking.

The combined mean of the questions relating to the factor of Perceived Usefulness was 3.668. Detailed full results for the factor of Perceived Usefulness can be found below in Table 4.4.

Table 4.4

Survey Results of Perceived Usefulness

Question	Min.	Max.	Mean	Std. Deviation
Q1_1-Perceived Usefulness: Using Institutional Repository systems allows the library to complete related tasks in a timely manner.	1	5	3.44	0.861
Q1_2-Perceived Usefulness Using an Institutional Repository system allows the staff of the library to increase productivity.	2	5	3.27	0.762
Q1_3-Perceived Usefulness Using Institutional Repository systems enhances the value of the library within my institution.	2	5	4.31	0.655
Q1_4-Perceived Usefulness Using Institutional Repository systems makes it straightforward for users to locate the materials they are seeking.	1	5	3.31	0.874
Q1_5-Perceived Usefulness I find Institutional Repositories useful in my job.	2	5	4.01	0.852

Note. N=143

Perceived Ease of Use.

The question within the Perceived Ease of Use factor which resulted in the

highest favorable response, with a Mean of 3.73, by survey participants was related to the statement that learning to use the IR was easy for the survey participant.

The question within the Perceived Ease of Use factor which resulted in the lowest favorable response, with a Mean of 2.73, by survey participants was related to the use of the IR system to the implementation of the IR system was clear and understandable.

The combined mean of the questions relating to the factor of Perceived Ease of Use was 3.322. Detailed full results for the factor of Perceived Ease of Use can be found below in Table 4.5.

Table 4.5*Survey Results of Perceived Ease of Use*

Question	Min.	Max.	Mean	Std. Deviation
Q2_1-Perceived Ease of Use Learning to use the Institutional Repository was easy for me.	1	5	3.73	0.911
Q2_2-Perceived Ease of Use I find the Institutional Repository easy to use.	1	5	3.62	0.984
Q2_3-Perceived Ease of Use The implementation of the Institutional Repository system was clear and understandable.	1	5	2.73	0.964
Q2_4-Perceived Ease of Use I find the Institutional Repository to be flexible to interact with.	1	5	3.24	0.958
Q2_5-Perceived Ease of Use The Institutional Repositories enhances the efficiencies of processes within the library.	1	5	3.29	0.893

Need.

The question within the Need factor which resulted in the highest favorable response, with a Mean of 4.37, by survey participants was related to the statement that the IR is necessary to meet the functions of the modern academic or research library.

The question within the Need factor which resulted in the lowest favorable response, with a Mean of 3.98, by survey participants was related to the statement that the IR improves the work processes of the library.

The combined mean of the questions relating to the factor of Need was 4.20.

Detailed full results for the factor of Need can be found below in Table 4.6.

Table 4.6*Survey Results of Need*

Question	Min.	Max.	Mean	Std. Deviation
Q3_1 - Need The Institutional Repository improves the work processes of the library.	1	5	3.98	0.86
Q3_2 - Need The Institutional Repository is necessary to meet the functions of the modern academic or research library.	2	5	4.37	0.748
Q3_3 - Need The Institutional Repository is a necessary component to meet the needs of my academic or research institution.	2	5	4.25	0.86

Cost-Effectiveness.

The question within the Cost-Effectiveness factor which resulted in the highest favorable response, with a Mean of 3.66, by survey participants was related to the statement that the IR provides a good value for the overall cost of the system.

The question within the Cost-Effectiveness factor which resulted in the lowest favorable response, with a Mean of 3.22, by survey participants was related to the statement that the IR provides cost savings over implementing other digital library services and infrastructure for my institution.

The combined mean of the questions relating to the factor of Cost-Effectiveness was 3.46. Detailed full results for the factor of Cost-Effectiveness can be found below in Table 4.7.

Table 4.7*Survey Results of Cost-Effectiveness*

Question	Minimum	Maximum	Mean	Std. Deviation
Q4_1 - Cost-Effectiveness The Institutional Repository provides a good value for the overall cost of the system.	1	5	3.66	0.905
Q4_2- Cost-Effectiveness The cost of ongoing maintenance of the Institutional Repository is lower than the other major library systems, such as the Integrated Library System (ILS).	2	5	3.5	0.926
Q4_3 - Cost-Effectiveness I would consider the Institutional Repository to provide cost savings over implementing other digital library services and infrastructure for my institution.	1	5	3.22	0.883

Reliability.

The question within the Reliability factor which resulted in the highest favorable response, with a Mean of 4.13, by survey participants was related to the statement that the IR improves the availability of critical research and content within their institution.

The question within the Reliability factor which resulted in the lowest favorable response, with a Mean of 3.05, by survey participants was related to the statement that the IR is more reliable than other digital library services and infrastructure.

The combined mean of the questions relating to the factor of Reliability was 3.73. Detailed full results for the factor of Reliability can be found below in Table 4.8.

Table 4.8*Survey Results of Reliability*

Question	Minimum	Maximum	Mean	Std. Deviation
Q5_1 - Reliability The Institutional Repository improves reliability of accessing digital content within my institution.	2	5	4.01	0.746
Q5_2 - Reliability The Institutional Repository is more reliable than other digital library services and infrastructure.	1	5	3.05	0.763
Q5_3 - Reliability The Institutional Repository improves the availability of critical research and content within my institution.	2	5	4.13	0.78

Semi-structured Interview Results*Introduction*

Three interviews were conducted beginning on July 2, 2021 and concluding on July 16, 2021. The following sections include an explanation of the interview participants as well as sections that contain the results from each interview. The interview questions were framed in a way to provide further exploration and insight into the survey results. The interviews were conducted using Zoom and the interviews were recorded and auto-transcribed using the Zoom platform. Once final corrected transcripts were produced, the original audio recordings were deleted so that the participants' confidentiality was preserved as outlined in the research protocol agreed to in the IRB.

Participants were sent an invitation email with a link to an online consent form. Each participant completed the consent form before the interview process started.

Interview with Participant #1

The first interviewee is a Library Dean at a Public Land Grant university in the southeastern United States. This institution is classified as a R1: Doctoral University (highest research activity) in the Carnegie classification system (Carnegie Classification of Institutions of Higher Education, 2019). They have previously held leadership and director positions at a number of other academic institutions across the United States. They have been at their current position for less than five years.

The first topic to explore during the interview was the participant's experience in the adoption, migration, or continued support of your library's institutional digital repository.

This interviewee indicated that the institution is currently using a vendor hosted IR system that was in place before they had started as the Library Dean. From their understanding was that this decision was based on a number of factors including the limited availability of both library and technology staff to manage an on-campus hosted solution. During this time they also looked at other open-source IR solutions, which they felt had a wider feature set, but did not feel that they were capable of managing with their staff levels at that time.

Given changes in the hosted platforms ownership, additional features needed, rising yearly costs, and the ability to customize the system, they are currently looking at different systems that may be able to meet their current needs. Since the years that their

current system was implemented the technology hosting and support landscape has changed for libraries and there are more open source systems that are available through consortial library groups that offer hosting and support to open source IR and other library technology systems.

What factors have been most influential in adopting and continued support of the institutional repository systems?

The interviewee believed that the use and value that the IR system has on the institution by being an avenue to capturing the student work and other publications produced by the institution. They felt that some of the original ideas on these systems as a way to capture the research output from faculty has lessened, because faculty have their own established avenues for disseminating research and publications, and “they seem to totally ignore libraries, including mine.” Additionally, there are increased efforts for the systems that the library has to store various types of digital data, including research data, and not just final published or other traditional text-based formats. This has led to the need to examine specialized systems for these types of needs. There was a desire as a non-IT person that there be a system that can be used to house various types of unique data to provide a preservation system and an access system. One desire expressed is for “a system, but that doesn't exist, that I'm aware of, the perfect system that does all those things,” yet this “doesn't exist quite yet.”

From a survey that contained five influencing factors, it was found that need, perceived usefulness, and reliability were the three most important factors identified. In your opinion do you agree that factors are important?

The interviewee conveyed that there was a need for an IR system hosted by the library at the institutions, although with individual technologies this need is advocated from the specialized professional librarians and archivists working within the library. He noted that given the breadth of library technologies available, he has “. . . certainly moved away from the idea that I go to a conference and find a shiny object and bring it back” to recommend the adoption of it. Most of the recommendations that they receive are from librarians who bring to them a certain technology that they would like to implement. One of the large factors that they look for is to seek what the benefits to users are for a given technology. Then further exploration includes looking at if this technology actually meets the need, which overall many times includes the benefit of increasing access to collections for users. Many times if it will allow better access to materials, such as archived collections, then they are okay with supporting the adoption.

The support of this type of technology is only the start of the actual process, there are other factors that need to be looked at from their perspective. One of the major ones is the cost of the system and if there are other products that can meet the need that may be examined, because if a product is a certain price, then an RFP process may need to be undertaken, which involves soliciting from a number of companies to make sure you are purchasing the system at a fair market cost compared to the competitors. Even as the Library Dean, they work under certain policies and funding structures, and they “can't just click my fingers and do this.”

One additional factor that the interviewee noted that was not part of the five areas of the survey, is the factor of if the technology is sustainable. This sustainability is both at

a staffing and financial level moving forward. Sustainability is one of the interviewee's most important factors, since we have been through generations of technologies and had experienced some that were not sustainable in operations or upkeep. With many technologies, especially home grown technologies, they are reliant on a certain person, who if they leave the institution the technology can become orphaned and ongoing maintenance becomes an issue.

Are these influential factors similar for other technologies that have been implemented by the library?

The interviewee expressed the opinion that the factors that influence the IR adoption and support are similar to the factors involved with supporting other library technology systems. As the library dean, the interviewee expressed the idea that they were informed about potential new systems from the subject area experts that worked for them. The advocating for the need and value of the system is coming from the experts in the areas that are requesting the systems. They stated that they are "no longer the one that does the research on the systems" *and that* being the decider at the Library Dean level does not really involve being an expert in the given system. Once it is determined that there is a benefit toward our mission, then the main factor is if the interviewee can find the money to fund the implementation.

Given the constant flux in budgets at academic institutions, not all technologies that could be implemented can be due to a lack of funding. When cases like this arise, are there alternative less expensive technologies that we can implement as a stopgap

measure, while they “try to scrape money together and advocate somewhere to be able to purchase the software if that's what you want.”

Interview with Participant #2

The second interviewee was also with a Library Dean at a Public Land Grant university in the southeastern United States. This institution is classified as a R1: Doctoral University (highest research activity) in the Carnegie classification system (Carnegie Classification of Institutions of Higher Education, 2019). They have previously held leadership and director positions at a number of high level governmental library related institutions in their career. They have been at their current position for more than 10 years.

The first topic to explore during the interview was the participant’s experience in the adoption, migration, or continued support of your library's institutional digital repository?

Given this interviewee’s extensive history working across both government and academic libraries, they reviewed their past experiences in leading changes in technology infrastructure from the time that the internet and the world wide web was just starting to impact information dissemination and research. These changes include the shift in the ways both libraries and information providers disseminated the information and how there was a drastic shift in a limited number of years in the move from print to digital resources, stating “AI went through changing the . . . program for really in effect of a distribution of print materials to a distribution of electronic materials.”

In the interviewee's current institution, they had in place a digital repository system in place before they had started in her position over a decade ago. This system was hosted on campus and was locally developed. As the system progressed and there was increased pressure to increase the digital materials that the library was responsible for there were investigations into other platforms, which given their limited capabilities were not migrated to. However, the interviewee stated that "those kinds of tools were most often really focused on a relatively small set of content [types]." The decision was made to expand the current platform to accommodate other digital material types. They felt that it was important that the system, not only collected institutional materials, but also housed other publicly accessible information, like government documents, there was a sense that there was a real value that these systems met for both the institution that they are at, as well as, the broader regional community and public that they serve as part of their mission.

What factors have been most influential in adopting and continued support of the institutional repository systems?

The interviewee expressed that there was a need to continue to support and even expand the presence of the IR, which they felt with the broadening of digitization efforts on materials there were intended to be accessible by the public. This pressure to expand the types and quantity of publicly accessible information that was brought about due to new collaborations and partnerships, including expanding the amount of materials being digitized including those funded through major grant awards. As the digital library expanded to include materials that were not traditionally a part of an IR, such as digitized

archival newspapers, there were decisions on the type of platform to be used and if they should broaden the system to include these or look for other systems. Ultimately, the digital library system was continually expanded to include these varieties of materials.

As the system grew, ongoing and increasing costs were noted as a significant factor in influencing how to move forward with supporting the IR and related systems. These costs also needed to be balanced with the need for a system that met the needs, but opportunities to look at systems that were more cost efficient and the need to lessen the staff resources needed to maintain the system were part of the ongoing evolution of the system. Within large institutions the technology systems that were once self-hosted within the libraries themselves, which were staff and technology intensive, this model has moved towards working with campus-wide IT to host the server infrastructure. This presented a cost effective and lessened the need to dedicate specialized technical staff needed to administer these systems, which allowed the library staff to mostly focus on the needs around the digital content and library related functionality of the system. This also allowed the library to create a “wonderful partnership (with campus IT) and a very appropriate one and it means that we have that elasticity of growing as we need it without constantly coming back to our budget, you know and and scrounging around for more money to buy more disk drives and more computers to run them.”

The interviewee also expressed that a major factor to support these systems were in the benefit that they brought to users.

From a survey that contained five influencing factors, it was found that need, perceived usefulness, and reliability were the three most important factors identified. In your opinion do you agree that factors are important?

The second interviewee agreed that the factors of need, perceived usefulness, and reliability were important in the ongoing support of a system like the IR. Cost is an important factor, however, the interviewee expressed that given the large amount of funds being spent on staffing and resources in the areas of both digitalization and technology, demonstrates the existing commitment to digital library systems.

One factor that this interviewee felt was important was that we needed to focus on was that it is important that with these systems that gather research and other academic content from the University, is that the library needed to be conscious that “our relationship as how the libraries are perceived as being supportive and friendly and helpful.” This statement was brought on by the fact that many other academic institutions initially used the IR as a way of encouraging policies that would require faculty to deposit their publications. The interviewee felt that these institutions “were extremely aggressive as part of their in theory open access but more an anti-publisher attitude of leveraging the IR to gather content from their authors.” Keeping the libraries in a more supportive and friendly relationship with faculty was perceived as very important and more focus was placed on areas, such as thesis and dissertations, which added access and value to the institution without creating additional publishing requirements for faculty. The interviewee shared that at their institution they looked to make “making the content of our authors broadly available in a ufo context, without burdening them right.”

The interviewee also stated that these systems needed to be easy to use and intuitive for users to access content. They perceive the focus of the IR “is a place where you can put a poster or conference paper or the kind of thing that's not going to be published in the journal” and that the “intention of the IR for both access and preservation.” Libraries need to “make it (IR) available, let's make it easy if you can attach a document to an email, you can upload something into the IR and fill out the little form that gives us the metadata.” They perceived the IR as “less of a repository for published journal articles.”

Are these influential factors similar for other technologies that have been implemented by the library?

The interviewee reflected on their past history with implementing library technology, including moving from the print resources into being able to provide this on CDROMs and the lessons learned, including the need to make the technologies easy, intuitive, and self-explanatory for users. However important user experience is, the interviewee reflected that this process is “really hard, particularly when you have (10s of thousands) students and (thousands) faculty. It's really, really hard to understand that user experience because they're all different.” The interviewee expressed the idea that in libraries we “run the risk of falling into the trap, that we know the content and we think about how to organize the content, how to display it, but it's really, really hard for us to walk in their (users) shoes”.

Another factor expressed by the interviewee was that there needs to be a level of stability to these systems for the users, especially the faculty users, stating that “it takes a

long time to reach the Faculty and to get them comfortable with something we're doing and with the students there's this constant churn so they're here for years or so, even if they are a PhD student they're only here for five years right so you're constantly having to capture new users and get them up to speed without disadvantage in the old users.”

A last factor that the interviewee feels is important with systems, like an IR, is that researchers or students that create the content are not experts in creating the metadata that will be used for describing and ultimately in the indexing of the item for other users to search and find. This factor also aligns with a system that is easy to use and intuitive and also links to the factor of cost, because if library staff need to be focusing on creating detailed metadata this involves costs as well.

Interview with Participant #3

The third interviewee has the senior leadership position at their institution and has the title of Vice-Provost and University Librarian at a Public Land Grant university in the east coast of the United States. This institution is classified as a R1: Doctoral University (highest research activity) in the Carnegie classification system (Carnegie Classification of Institutions of Higher Education, 2019). The interviewee has previously held senior librarian positions at other prominent libraries within the United States. They have also served in senior leadership roles for national academic library associations. They have been at their current position for the past five years.

Experience in the adoption, migration, or continued support of your library's institutional digital repository?

The third interviewee indicated that their institution is currently using an open source IR system, that has been in place for years and was in place before they had started as the University Librarian. Although the system has not changed while they have been there, they have undergone an upgrade to the system. The IR system that they have in place has met the current needs so there has not been much investigation into changing to a different IR system.

What factors have been most influential in adopting and continued support of the institutional repository systems?

The interviewee stated that one of the primary factors with supporting the system is in the ease of use of the system. From their perspective the ease of use pertains to the researchers and “how easy it is for them to deposit their materials and create metadata, without really understanding, necessarily, that they’re creating metadata.” Additionally, they feel that the ease of use needs to be from the staff perspective as well. From the staff side, ease of use includes maintaining the cleanup of the metadata, as well as other system maintenance tasks.

Cost was also an influencing factor for this interviewee in continued support of an IR. These were not necessarily just in the costs of the technology, but also in the staffing costs associated with the service. In their case, the system is open source so there is not a vendor that is paid for their system, but there are costs involved in the hosting of the system. This institution is hosting its own IR system and similar to interviewee two, the campus central IT is where the system is actually hosted. This alleviates the need for the

library to operate and manage its own servers and the technical staff needed to maintain the infrastructure.

From a survey that contained five influencing factors, it was found that need, perceived usefulness, and reliability were the three most important factors identified. In your opinion do you agree that factors are important?

The interviewee agreed that there is a value to the institution in the library hosting an IR, and that the library has the role to “capture what our faculty or researcher or scholars are doing and because you know that obviously helps with ranking and all these other things, that the institution concerned about, and so there’s a need for the institutional repository.”

The interviewee also agreed that the survey factors that ranked high were important, with other factors of ease of access being mentioned as important.

Are these influential factors similar for other technologies that have been implemented by the library?

The interviewee was able to present a number of influencing factors that they feel are important in the decision to adopt library technologies. The first of these factors was that the technology or system would be able to present a significant return on investment, stating “what's the benefit, you know if it's going to create greater efficiency in the way that we work, either from the staff perspective, or is it going to be benefit for from the user perspective.” From the user's perspective, they acknowledged that the word significant was subjective, but “we can certainly determine if we're going to save the user three steps out of an eight step process, you know that's probably significant.”

The second influencing factor that was shared by the interviewee was if the technology system would “help us achieve our goals, is it aligned with our strategic directions.” The interviewee felt that as part of their decision making process, they need to consider the purpose and function of this technology or system and if it “aligns with our strategic directions.”

The final influencing factor that the interviewee stated was the cost of the system. They stated that this was not only the financial cost, like the implementation costs, but more wider costs “in terms of time and dollars and efficiency.” Related to the cost factor, the interviewee also indicated that most systems require some degree of integration with other systems, that are managed by campus IT and so before systems can be adopted there needs to be planning and scheduling to allow for this integration work to happen, which may not be on a timeline is convenient for the library plans for the implementation.

Summary of Chapter

The analysis of the TAM survey and semi-structured interview data work together as a research method in that it allows us to better understand the research question from both the broad framework of the survey instrument as well as the more reflective qualitative data that was gathered as part of the interviews.

By combining the data from the surveys and the interviews, there appears to be alignment between the findings. The participants in both the survey and the interviews provided valuable insights into the research questions being asked. Although all the factors that were being researched resulted in being considered important in the adoption of IR systems, the survey found that need, perceived usefulness, and reliability were

found to have scored higher than perceived ease of use, and cost. When analyzing the interview data, the factor of cost was seen as having a higher significance than how it scored in the survey results.

The following chapter will provide an interpretation and summary of the findings, as well as including personal reflection on the factors that influence academic library leaders to adopt and support IRs.

CHAPTER FIVE

Discussion

Introduction

In this study, I assessed the influential factors of why academic library leaders adopt and support IR systems within their institutions. The goal of my research is to increase existing knowledge and contribute to the understanding of the factors influencing the adoption of IR systems within higher education libraries. Through the use of the TAM survey instrument and subsequent semi-structured interviews, 143 academic library leaders from across the United States were surveyed and then three library deans or directors were then interviewed. This chapter provides a summary of the research findings from both the survey and then the interviews, connections between the results. Key learning outcomes, study limitations, implications and suggestions for future research, will also be discussed.

Summary of the Research Study

The research question of this study focuses on how the factors of usefulness, ease of use, need, cost effectiveness, and reliability influence academic library leaders' decision making process regarding the adoption and ongoing support of technology initiatives, in this case IR systems. In order to study this research question, a mixed method research study was used that consisted of using a quantitative research survey instrument that was adapted from the Technology Acceptance Model (TAM), that was then followed by semi-structured interviews to address the research questions presented in this study.

The survey component of the study was carried out during the month of January, 2021 using the online survey tool Qualtrics. A total of 986 participants were emailed the survey link, of which 174 responses were received. After removing partially completed surveys, there were 143 fully completed surveys, which resulted in a return rate of 14.5%. Following the survey, three Library Deans were invited to be interviewed. These interviews were conducted beginning on July 2, 2021 and concluding on July 16, 2021. The interviews were conducted using Zoom and the interviews were recorded and auto-transcribed using the Zoom platform. The interviews were conducted with the condition that anonymity would be maintained for their responses.

Findings of the Survey Component of the Research Study and Connections to the Literature

The survey results were analyzed and the full findings are reported in Chapter 4 of this study. The results indicated that the rank of importance of the factors, starting with the highest to lowest, were Need, Perceived Usefulness, Reliability, Perceived Ease of Use, and Cost. For each of these factors, a number of questions were asked of the respondents that represented aspects of each factor. As a way to place understandable meaning on these results, it will be important to surface the statements that were most favorably scored. The following summary of the survey findings will look at each of these factors and the question in each category that resulted in the highest favorable score. These leading statements will then be examined in comparison with the interview data to see if there is any alignment of opinions that take place.

The influencing factor that ranked the highest overall was the factor of the Need for an IR. The statement that scored the highest favorable ranking in the factor of need was that “The Institutional Repository is necessary to meet the functions of the modern academic or research library” (Survey factor 3, Question 2). This result indicates that there is the opinion from academic library leaders that the IR is now considered a necessary component of the systems and services that an academic library offers. This finding adds to and aligns with previous research on the benefits of an IR at academic institutions (Branin, 2005; Burns, Lana, & Budd, 2013; Goodyear & Fyffe, 2006).

As COVID-19 impacted libraries and limited the physical access to materials, the IR became an increasingly visible tool for disseminating research on campuses, as with the example from Martin and Schwartz (2020) with it being used to showcase resident research which was formerly done in person.

The influencing factor that ranked second highest in the survey was the factor of reliability of the IR. The questions that pertained to the factor of reliability included questions regarding the reliability of the system itself, along with was the system reliable in being able to make content available. The statement that scored the highest favorable ranking in the factor of reliability was that “The Institutional Repository improves the availability of critical research and content within my institution” (Survey factor 5, Question 3). This result indicates that there is the opinion from academic library leaders that the IR plays an important role in making sure that research and other content that is stored on the IR is reliably available for researchers. This finding continues to demonstrate that the ability to provide reliable access to and safeguarding institutional

knowledge is seen as a significant factor in supporting IRs and is consistent with other literature in this area (Burns, Lana, & Budd, 2013; RLG/OCLC Working Group on Digital Archive Attributes, 2002).

The influencing factor that ranked the third highest was the factor of the Perceived Usefulness of the IR. The statement that scored the highest favorable ranking in the factor of Perceived Usefulness was that “Using Institutional Repository systems enhances the value of the library within my institution” (Survey factor 1, Question 3). This result indicates that there is the opinion from academic library leaders that the IR is seen as a useful system that enhances the value of the library to its users and the university community.

The influencing factor that ranked the fourth highest was the factor of the Cost Effectiveness of the IR. The statement that scored the highest ranking in the factor of Cost Effectiveness was that “The Institutional Repository provides a good value for the overall cost of the system” (Survey factor 4, Question 1). As the literature indicated the costs and funding of IRs are an important factor (Bevan, 2007; Burns, Lana, & Budd, 2013; Giesecke, 2011; Rieh et al., 2007) and the results of this study show that it continues to be an important factor that influences leadership decision making.

The influencing factor that ranked the lowest of the five factors examined was the factor of the Perceived Ease of Use of the IR. The statement that scored the highest favorable ranking in the factor of Perceived Ease of Use was that “Learning to use the Institutional Repository was easy for me” (Survey factor 2, Question 1). This result indicates that there is the opinion from academic library leaders that the IR is a relatively

easy system to use. The one caveat for this category is that as library staff, the IR is used both from a user accessing content standpoint and from a backend (non-public) staff processing standpoint, so this nuance was not broken out in this survey option, unlike other research in this area (Rieh et al., 2008). Overall, however, the IRs are seen as systems that are not difficult to use.

The survey questions have provided insight into answering the research question of this study. Although the factors of usefulness, ease of use, need, cost effectiveness, and reliability were not equally scored for their importance, they all had mean scores that fall between neutral and strongly agree on the Likert scale that was used. These scores support the ideas that the five factors do influence academic library leadership in their decision making on the adoption and continued support of their IR.

Findings of the Interview Component of the Research Study and Connections to the Literature

The interview results were fully reported in Chapter 4 of this study. Three interviews were conducted beginning on July 2, 2021 and concluding on July 16, 2021. The interview was conducted in a semi-structured method which used prompting questions that were framed in a way to provide further exploration and insight into the survey results. The following section examines the emergent themes that the interview data revealed through a process of coding and categorizing.

Given that the interviews were semi-structured and that the interviewees were able to broadly discuss and reflect on the nature of the questions, themes relating to the

overall research questions emerged throughout the interview period and were not necessarily in response to an individual question.

The first emergent theme that was highly present from all the interviewees was the consideration of cost, in its many forms, and how it relates to continued support and adoption of IRs. Although this theme emerged as important during the interviews, it was scored as the fourth most important factor in the survey results. A possible cause for this difference may be a result of the survey respondents having varying degrees of fiscal oversight and responsibility for IRs, where the interview respondents all had direct fiscal responsibility in this area.

The theme of cost included ideas such as the costs to vendors for software, and that the ongoing costs were a large factor to determine if there was a need to look for alternative systems. This theme aligns with Bankier and Gleason (2014), in that costs can include more than just the cost to purchase a system.

Related to this the theme of costs included the ability to fund the ongoing technology infrastructure such as servers and hosting. Further, the interviewees communicated that the cost factor that relates to staffing is also important, since with a service like the IR, you have the technology experts needed to maintain and configure the systems, and you also have the professional and clerical staffing needed to support the daily workflows, such as working on metadata, scanning, and working with users that may be submitting items. The staffing aspects of the cost theme align with the literature that discussed these topics (Bevan, 2007; Burns, Lana, & Budd, 2013; Giesecke, 2011). As Rieh et al. (2007) indicated, a number of the IR systems at institutions were initially

implemented with funding that was one time funding that may not be ongoing, which is an important factor, especially if a new system needs to be purchased with funds that are not recurring.

Related to the theme of cost was the a sub-theme of sustainability of the IR system, which related to keeping the system operational, but also maintaining dedicated staffing levels, and keeping the system updated into the future as technology changes occur.

Another main theme that emerged was that these academic library leaders were focused on the benefits to the community of users of the IR. The theme of the benefit to users was along multiple directions that were tied to two of the factors that the survey examined perceived usability and perceived ease of use, that aligns with the previous research in this area by Burns, Lana, and Budd (2013). Since the IR is both a system to store materials, as well as access materials by users, the interviewees spent a considerable amount of time discussing the system as a way for users to more easily access research materials and ensure that there would be some ongoing storage of these digital materials into the future.

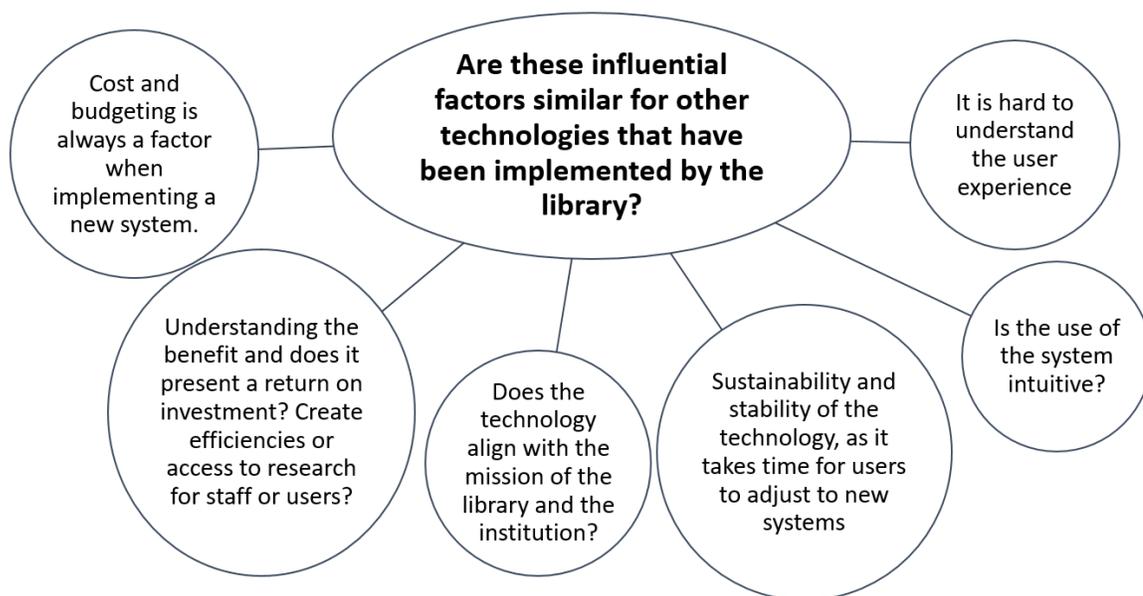
The institutional value of the academic library providing an IR system, was also a theme that emerged from the interviews. As academic libraries create strategic plans and missions which align with the larger institutional missions, there was a strong opinion that the IR, and other library systems help the library achieve their goals and that it is aligned with the libraries strategic directions.

Decision making theme of using the expertise of those in the library to advocate for a technology, but the need for the leader to be able to understand the technology from a more global and institutional level. There was a general theme that these leaders did not consider themselves as library technology experts, even though they had more day to day experience with library technology in their past library roles. The theme of decision making was important because it ties the ideas of managing funding and costs, as well as being able to use the expertise they have within their institution for both recommending and justifying library technology systems.

When the interviewees were asked about if the factors that influence the adoption or support of IRs were similar to those used when making decisions about other technologies, the themes that emerged aligned with the factors being explored during the study. A visual representation of the themes that emerged can be found in Figure 5.1 below.

Figure 5.1

Emergent themes from the research interviews



The interview data provides additional insight into answering the research question of this study. The factors of usefulness, ease of use, need, cost effectiveness, and reliability were seen as important, but the leading themes differed from the rankings of the survey data. A key result of the interviews was that cost was seen as a prominent factor that underlies all the other factors as can be seen in the various cost related themes represented in Figure 5.1.

Limitations

This research study surveyed and interviewed senior academic library leadership at academic research libraries and the author selected participants based on the individual's title. Since job titles do not necessarily represent the overall decision making authority it is expected that the survey respondents were varied in their responsibilities

and their answers would reflect these differences. Given the demographic questions being answered it is also clear that not all these individuals were responsible for the oversight of the IR or also had authority over the technology purchasing and funding within their libraries. It was decided not to parse the survey data based on the demographic answers given by the survey respondents and this was mainly done to give a more broad based idea of the influencing factors, since all these individuals were at a senior enough level to have some influence and perspective over the senior decision maker in their library.

A further limitation of this study was that although this study uses the TAM survey, it did not fully use the advanced statistical tests and should not be considered an example of complete TAM based study. The data in the survey was fully gathered in accordance with other TAM studies that have been conducted, yet given that this research study also involved a qualitative semi-structured interview, it was decided to only use the mean data of the survey responses and not do the further statistical significance testing which would further explore the relationship between the TAM factors and the adoption of IRs.

Implications for Practice

As an academic librarian and a library technology leader, I have often worked with both academic library leadership and campus technology leadership with the selection and implementation of technology systems in our institutions. This research study which explores the ideas and factors that influence academic library leaders in the adoption and support of library technology, specifically the IR, has enabled me to explore this topic in a much greater detail. With the information gathered I hope to increase the

structural knowledge on how to present the ongoing needs for the IR and other library technology systems to both my colleagues and to senior library leaders. In the role of an academic library technology leader, it is critical that I present information about library technology systems in ways that address and support the library's overall goals and needs. The following are the main highlights and recommendations from this research study.

IR related implications

The IR or similar repository systems continue to fill an important and needed role for academic and research libraries that address the needs of both staff and users of the library. There continues to be support for the IR systems by academic library leadership and moving into the future these systems will need to be supported and maintained. This will result in IR systems that will need constant updating and changes to the underlying technologies as campuses adapt to how technology infrastructure is deployed and supported.

The data from the interviewees highlight the various ways in which IR systems have changed in the past and how there continues to be a need for these systems to integrate additional types of new research data and media that needs to be stored. The need for IR systems that can accommodate a wider range of digital materials and research, is further being expanded as libraries are increasingly becoming involved in the role of open access publishing efforts (Rowley et al., 2017) and look to systems like IRs to fill these needs (Asadi et al., 2019).

Leadership and Decision Making Implications

Since leadership and decision making is at the heart of my research interest, there are a number of implications that result from this study and that can lead to changes in praxis for working with these leaders in the decision making process, especially when it applies to the adoption or continued support of technologies. Below I identify two implications that this research supported.

Academic library leaders are greatly influenced in adopting and supporting technologies that align with the needs of the campus users, as well as, can be shown to directly link to the strategic plans/directions and missions of the academic libraries and the institution as a whole. Recognizing that library leaders are examining how these technologies align with their goals, it is important that we structure technology initiatives in ways in which we are able to clearly communicate how these technologies support these goals. It is not only important to communicate the purpose and functionality of the technology or system, but we have to articulate how having the technology is a long term benefit for both the library and campus.

A second implication with regard to library leadership, is that the influencing factor of funding is present within the decision making process. This factor was especially emphasized in the results of the interview data. Even with a technology that is deemed very important to implement, availability of funding is an ever present thought. This is an important fact to make sure we are cognizant of as we plan and seek support for technology implementations. It will be important that technology planning includes the ability to include alternative solutions and strategies for implementations as funding

for the ideal technology system is sought out. Additionally, it may be important to present various technology adoption approaches using a good/better/best model at different price points to help aid senior leaders in supporting a technologies selection and adoption.

Further Research Possibilities

This research study produced valuable insights into the research question being asked, however, with the amount of data that was accumulated from both the surveys and the interviews, additional questions arose and further questions surfaced that can be the focus of future research.

One area of focus for further research is with the accumulated data from the TAM survey that was administered. The focus of this research used the TAM survey instrument as a way to use a previously validated approach to examining influencing factors for technology adoption, in this case the IR. Since this research looked more generally at the favorable scoring of the TAM factors, and then using these as a framework for the interview discussion, there is a further research that can be conducted with the data to examine the relationships between these variables and how, in a combined way, they support the acceptance of the technology being researched.

Additionally, the survey data included demographic data that identified the level of responsibility that the survey participant has over the IR and over the technology purchasing decisions for the library. By studying this data further it may be possible to identify if there are differences in the influencing factors of support and adoption depending on your position in the library or your level of oversight in the area of IRs.

Finally, another avenue for further research would be to examine the factors that influence the adoption and support of other technologies across academic institutions, by non-library academic technology decision making..

Conclusion

The purpose of this research study was to investigate the influential factors of why academic library leaders adopt and support IR systems within academic and research institutions. Having been working in the field of academic library technology for the past 25 years, as a librarian, faculty member, and as an academic administrator, I have experienced a large number of library technology implementations and an equally large number of library and academic administrators that I navigated the process with. Throughout my time in this profession, I have seen an evolution of the technology decision making tendencies of library leaders which have followed the evolution of the technologies being implemented. In the early years of the World Wide Web academic libraries were in a process of moving from a mainly print to a digital information ecosystem. It is my opinion that in these early years library leadership played an important role in seeking out and being drivers of the adoption of new library technologies. As library technologies have matured and stabilized, the push to adopt or support specific library technologies is happening at the level of the subject matter expert or area expert within the libraries, such as the archivists being the people to advocate and push for digital preservation and archives related systems. This research study has given me new insights into how library leadership supports systems like the IR and will

influence a range of strategies that I am able to infuse into my daily practice as a library technology leader.

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APPENDIX A: Survey Instrument

Adapted from *An investigation of Influencing Factors for Adopting Federated Identity Authentication in Service-Oriented Architecture (SOA)* by Y. Tadesse, 2012, (Doctoral dissertation), retrieved from ProQuest Dissertations and Theses database.

Part I

Below are 18 statements about Institutional Repositories (IRs). Please indicate whether you agree or disagree with each statement by selecting the appropriate response (Strongly Agree to Strongly Disagree) that closely matches your perception of IRs. Part II of the survey consists of 3 demographic questions that will also be used for statistical analysis purposes.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Section 1 - Perceived Usefulness:					
Using Institutional Repository systems allows the library to complete related tasks in a timely manner.					
Using an Institutional Repository system allows the staff of the library to increase productivity.					
Using Institutional Repository systems enhances the value of the library within my institution.					
Using Institutional Repository systems					

makes it straightforward for users to locate the materials they are seeking.					
I find Institutional Repositories useful in my job.					
Section 2 - Perceived Ease of Use					
Learning to use the Institutional Repository was easy for me.					
I find the Institutional Repository easy to use.					
The implementation of the Institutional Repository system was clear and understandable.					
I find the Institutional Repository to be flexible to interact with.					
The Institutional Repositories enhances the efficiencies of processes within the library.					
Section 3 - Need					
The Institutional Repository improves the work processes of the library.					
The Institutional Repository is necessary to meet the functions of the modern academic or research library.					
The Institutional Repository is a necessary component to meet the needs of my academic or research institution.					
Section 4 - Cost-Effectiveness:					
The Institutional Repository provides a good value for the overall cost of the system.					
The cost of ongoing maintenance of the Institutional Repository is lower than the other major library systems, such as the					

Integrated Library System (ILS).					
I would consider the Institutional Repository to provide cost savings over implementing other digital library services and infrastructure for my institution.					
Section 5 - Reliability:					
The Institutional Repository improves reliability of accessing digital content within my institution.					
The Institutional Repository is more reliable than other digital library services and infrastructure.					
The Institutional Repository improves the availability of critical research and content within my institution.					

Part II – Demographic Questions:

What is your current title?

- a) Dean of Libraries, Library Director, or University Librarian
- b) Assistant/Associate Dean of Libraries, Assistant Library Director, or Associate University Librarian
- c) Department Chair or Departmental Director
- d) Other:

Are you the primary individual within your library responsible for Library Technology related decisions?

a) Yes b) No

Do you currently have direct oversight of your institution's Institutional Repository system?

a) Yes b) No

APPENDIX B

Survey Email Invitation and Consent

Consent Letter Email Invitation for Institutional Repository focused Technology
Acceptance Model - Survey

Greetings,

My name is Todd Digby. I am a doctoral candidate in the School of Education at Hamline University in St. Paul, Minnesota. You are invited to complete an online Institutional Repository focused Technology Acceptance Model - Survey that I am conducting as part of my dissertation. My dissertation explores factors influencing the adoption of Institutional Repository systems within academic and research libraries. This study was approved by the Hamline University Human Subjects Research review board on 10/26/2020. If you agree to participate, you will complete the online survey using Qualtrics, an online survey system. Completing the survey will take about 10 minutes. Please only complete the survey one time. There is little to no risk involved in participating in this pilot study. If you agree to participate, your identifying information will be protected and your responses will remain anonymous. The results of this study will become part of my final dissertation and will be published in Hamline University's Bush Library Digital Commons. You may decide not to participate at any time without negative consequences. If you need additional information, please contact me via email: tdigby01@hamline.edu.

Sincerely,

Todd Digby

Doctoral Candidate

School of Education

To complete the online survey, please click on the link below. I understand that by clicking on the following hyperlink, I am agreeing to participate in this study:

<https://www.qualtrics.com/XXXX>

APPENDIX C

Interview Email Invitation and Consent

Consent Letter Email Invitation for Institutional Repository focused Technology

Acceptance Model - Interview

Greetings,

My name is Todd Digby. I am a doctoral candidate in the School of Education at Hamline University in St. Paul, Minnesota. As part of my dissertation research, I am seeking to conduct brief interviews with a number of academic library leaders regarding your perceptions on the adoption of institutional repository systems at your institution. My dissertation explores factors influencing the adoption of Institutional Repository systems within academic and research libraries. This study was approved by the Hamline University Human Subjects Research review board on 10/26/2020. If you agree to participate, please respond to this email and I will contact you to arrange a time and also provide you with a research consent form that needs to be completed before we start the interview process. The interview will be held using Zoom or via telephone and will take about 20 minutes. If you agree to participate your responses will remain anonymous and any institutional identifiers in your responses will be anonymized. The results of this study will become part of my final dissertation and will be published in Hamline University's Bush Library Digital Commons. You may decide not to participate at any

time without negative consequences. If you need additional information, please contact me via email: tdigby01@hamline.edu.

Sincerely,

Todd Digby

Doctoral Candidate

School of Education

APPENDIX D

Semi-structured Interview Questions

Academic Library Leaders Interview Questions

1. Can you describe your experience in the adoption, migration, or continued support of your library's institutional digital repository?
2. From your past experience, what factors have been most influential in adopting and continued support of the institutional repository systems?
3. From a survey that contained five influencing factors, it was found that need, perceived usefulness, and reliability were the three most important factors identified.
 - Need - The Institutional Repository is a core component of the modern academic or research library and fits a need of my academic or research institution.
 - Perceived Usefulness - Using Institutional Repository systems enhances the value of the library within my institution.
 - Reliability - The Institutional Repository improves the availability of critical research and content within my institution.
4. Are these influential factors similar for other technologies that have been implemented by the library?